

Building bridges between home and school mathematics: A review of the Ocean Mathematics Project

Joanna Bernie and Marie Lall
Institute of Education
University of London
July 2008



Leading education
and social research
Institute of Education
University of London

Cover photo: Mother and son participating in an Ocean Mathematics Project workshop.
© OMP

TABLE OF CONTENTS

SECTION 1:	4
1.1 <i>Executive summary</i>	4
1.2 <i>Introduction</i>	8
1.3 <i>The policy context - Ocean Mathematics and education policy</i>	8
SECTION 2: Literature review	11
SECTION 3: The Ocean Mathematics Project	22
3.1 <i>History of the project</i>	22
3.2 <i>Scope of the project</i>	23
SECTION 4	24
4.1 <i>The review</i>	24
4.2 <i>Methodology</i>	24
4.3 <i>Baseline</i>	25
SECTION 5:	27
5.1 <i>Aims, outcomes and lessons learned</i>	27
5.2 <i>Evaluation of operation and outcomes</i>	28
5.3 <i>School and teacher practice</i>	31
5.4 <i>'Lessons learned' and potential future developments</i>	31
SECTION 6: Voices of key stakeholders: parents, teachers and pupils	32
6.1 <i>From the parents' perspective</i>	32
6.2 <i>From the children's perspective</i>	37
6.3 <i>From the teachers' perspective</i>	40
6.4 <i>From the school's perspective</i>	46
SECTION 7	49
7.1 <i>Suggestions for maximising the effectiveness of workshops</i>	49
SECTION 8: Transferability of the Ocean Mathematics Project	51
8.1 <i>From an NDC funded project to charitable status</i>	51
8.2 <i>Handing-over phase</i>	51
8.3 <i>Ocean Mathematics website</i>	51
8.4 <i>New schools</i>	51
8.5 <i>Potential future challenges</i>	52
SECTION 9: Conclusion	54
SECTION 10: Appendices	55

Building bridges between home and school mathematics: A review of the Ocean Mathematics Project

SECTION 1:

1.1 Executive summary

The Ocean Mathematics Project (OMP) came into being in 2001. The aim of the project was to help children in one of the most disadvantaged areas in the country: a large post-war housing estate in Stepney, East London, called the Ocean Estate. The project sought to address underachievement in mathematics by changing the attitudes and practices of schools, parents and children, specifically through involving their parents in their child's mathematics learning process.

From five schools – three primary and two secondary – in 2001, today the Ocean Mathematics Project is being implemented in 27 schools, 22 of which are outside the Ocean Estate. The 27 schools are comprised of 18 primary schools, seven secondary schools and two special schools. After successfully piloting the Ocean Mathematics workshops at foundation stage in 2005-2006 (see Pound, 2006) the workshops have since been rolled out to seven different schools.

The purpose of this review is to focus on the spread of the project, making reference to the baseline drawn from two previous evaluations of the project (in 2003 and 2005) conducted by the Institute of Education. It also aims to evaluate the project's school based work and to identify the 'lessons learned' to date. The review focuses in particular on the parental involvement aspect of the project, but also looks at how the project has changed school and teacher practice.

Aims and design of the project

The project's original aims sought to bring about improvements in:

- Parents' confidence and participation in children's learning and progress; parents' own learning and participation in the life and work of the schools;
- Pupils' attitudes, behaviour and progress, shown in their approach to homework; their attitudes to mathematics and their confidence as learners;
- The life and work of schools in relation to mathematics teaching; staff attitudes and sharing of good practice; assessment, recording and reporting of progress in mathematics.

The project aims to increase attainment in mathematics for years 1 to 9, in particular at key stage 2 (KS2) and key stage 3 (KS3). Since the pilot in 2005-2006 the project has also spread to the foundation stage, with seven primary schools now delivering workshops in reception classes. The project combines managing the provision of homework with supporting workshops for parents, pupils and teachers.

Evaluation of operation and outcomes - successes

In 2005 the project received the Office of the Deputy Prime Minister's Educational Award in recognition of its success. The majority of participating schools have witnessed improvements – in some cases dramatic – in levels of mathematics attainment. In addition to improvements in achievement, however, over the years a myriad of wider benefits have become increasingly evident. These include improvements in parents' own mathematics

understanding; improved relationships between parents and teachers/schools as well as with their own children; teachers' own professional development and an increase in parental involvement both in school life and their child's education generally.

Contributory factors to OMP's success

A variety of factors have contributed to the success of the OMP. It is a combination of all of these factors that has made the OMP the success it is today.

- The professionalism, dedication and commitment from the OMP team.
- A commitment to involve all the key stakeholders.
- The flexibility of the OMP team to cater to the specific needs of the school, the parents and the pupils.
- The adoption of the OMP as an integral part of school practice, in line with national numeracy strategies.
- The recognition of different abilities.
- Support from senior leadership.
- The provision of sufficient space for workshops to take place, whether it be the mathematics classroom or in the main hall.
- Having an experienced mathematics coordinator on board.
- Good publicity and outreach work.

Obstacles experienced by OMP

The problems identified in previous evaluations have largely been overcome. Initial problems concerning staffing and the lack of effective management have been solved by the appointment of a very experienced and committed Project Manager and her team.

The uncertainty around funding has been a significant challenge throughout the life of the project, a challenge which would have stopped in their tracks many initiatives.

Perspectives of the key stakeholders: parents, teachers and pupils — key themes identified

- **Empowering parents to get involved in their child's mathematics education**
Parents related how the workshops have helped them to bridge the gap between how they were taught mathematics at school and how their children are being taught mathematics today. This gulf can be especially evident where parents have been educated in different countries and contexts.
- **Improving the relationship with the school**
Several schools commented on how the perception of the workshops by parents has changed dramatically during the life of the project. From parents viewing the workshops as an unwelcome obligation at the beginning, it has become an expectation; part of the school's activities.
- **Improving parent-child relationships**
In many cases this opportunity has led to improved communication between the parent and their child. Many parents related how much they enjoyed and valued the time spent with their child, both at the workshop and when doing the Ocean Mathematics homework together at home.

- **Parents' own learning**
This innovative approach not only empowers the child but also represents a non-threatening environment in which the parent and child are both learning together on an equal level.
- **Learning through making mathematics fun**
Crucial to engaging the children therefore has been the ability of the OMP and, since the schools have taken it over, the teachers, to devise creative and interactive games which engage children in the learning process.
- **Improving pupils' relationship with their parents**
Pupils welcomed the fact that their parents can see what they are learning and how they are doing in mathematics.
- **Engaging children in mathematics learning**
Many teachers have found that the interactive nature of the workshops and homework enables children to actually *understand* both the concept and the different processes which can be employed to obtain a particular answer.
- **Helping teachers' professional development**
Through delivering the workshops, receiving high quality training and dedicating time to select or create appropriate activities for workshops, the introduction of the OMP in both primary and secondary schools has also contributed to teachers own professional development. It has increased their confidence, changed their attitudes towards the teaching of mathematics and enriched their teaching practice.
- **Changes in teaching practice**
While there is a general policy shift towards game-based interactive teaching, the OMP gives teachers a concrete forum in which to explore these relatively new methods.
- **Improving the learning circle: parents – teachers – children**
The workshops have helped teachers to bridge the gap between home and school.
- **Support and flexibility from the OMP team**
Again, teachers have commented on the invaluable support they have received from the Ocean Mathematics Project team: the excellent training on how to deliver the workshops; the outreach support in getting the parents to attend the workshops; the provision of an interpreter and crèche worker, and perhaps above all, the willingness of the project team to respond to the individual needs of the school, parents and pupils.
- **Integration of the Ocean Mathematics Project into school practice**
In schools that have been running the OMP for several years, the Ocean Mathematics workshops and homework had become fully integrated into the life and culture of the school.
- **A spring-board for other parental involvement initiatives**
In numerous schools the success of the OMP has acted as a 'springboard' for other initiatives aimed at increasing the involvement of parents in their child's education, as well as initiatives which respond to the needs of the parents themselves.
- **Improving attainment**
While some schools have not witnessed improvements in attainment, others have seen dramatic rises in standards since introducing the OMP.
- **Improving the hand-in-rate and quality of homework**
All schools interviewed reported not only better hand-in-rates for the Ocean Mathematics homework but also an improvement in the quality of homework. Such improvements have often been quick to occur.

‘Lessons learned’ and potential future developments

As the OMP goes into its new phase as a charity, it aims to extend its reach to *all* schools across the UK, independent of the school’s characteristics such as class, setting (rural or urban), ethnicity of pupils and parents, or economic status of parents. Indeed, while research has shown that children living in low-income working class families generally have lower achievement levels, research also demonstrates that parental involvement in children’s education can be beneficial to all children, regardless of the above variants. Rather than the characteristics of the school, it is the factors identified under ‘Contributory factors to OMP’s success’ that will determine whether the OMP will be successful in a particular school or not.

We make the following recommendations:

- Where there are clusters of schools implementing the project, one mathematics coordinator or head of mathematics should be identified by the cluster schools’ senior management to be the main contact person with the OMP team. They would receive additional training to enable them to support the other schools within their cluster and ensure that certain standards are being met, for example, that workshops are being delivered in accordance with OMP guidelines; that effective outreach work is being carried out; that interpretation is of a high quality and that homework is being sufficiently monitored. It would also be important that they are given sufficient time to carry out their role effectively. Some cluster schools may chose to rotate this role.
- A long-term goal could be to recruit additional members of staff in regions where a significant number of clusters exist. This would relieve the strain on the team in London and facilitate logistics of monitoring project implementation in each school.
- It should be made clear to schools that the project is a long-term project and requires the full support of senior management. This should include full commitment to setting up a staffing structure to support the successful implementation of the project.
- The packages should include at least one observation of a workshop by the OMP team and an ongoing programme of refresher trainings whereby OMP can give feedback and teachers can discuss any issues or difficulties they may be experiencing. This could take place between six months and one year after the first workshop has taken place.
- The website should be updated to reflect the new framework for working with schools and to safeguard the high quality of the workshops. It should be made clear on the website that schools can only implement the Ocean Mathematics Project by first receiving one of the three packages. This needs to be non-negotiable, otherwise the hard-earned reputation of the Ocean Mathematics Project will be at stake. Certain parts of the website such as the downloadable homework should only be accessed with a password which all participating schools are given once they have gone through the initial stages of training. The website could also potentially be developed to include an internet forum in which participating schools share good practice or raise particular issues for discussion.

1.2 Introduction

When people hear the term 'school mathematics' they will likely picture classrooms of children silently working through pages of sums. The Ocean Mathematics Project (OMP) turns this traditional image upside down. Silence is replaced with interactive games and, rather than sitting next to their fellow classmates, pupils sit next to their mother, father, brother, sister or other family member. They are learning together through playing games in a fun and relaxed environment.

The subject at the heart of this review is parental involvement in mathematics education. Parental involvement in children's education has aroused significant interest over recent years. What kind of parental involvement, however, will be most effective in improving children's mathematics ability? Should parents support schools to fulfil their objectives, or is it a question of looking at the kind of support parents need to be able to engage with their child's learning process? This review aims to look at the realm of parental involvement in mathematics education and to evaluate an initiative – the Ocean Mathematics Project - that puts parents at the heart of their child's mathematics education. While locally based, the initiative has become nationally acclaimed, and if successful in its next phase, could be replicated in schools across the UK and further afield.

1.3 The policy context - Ocean Mathematics and education policy

Since the inception of Ocean Mathematics in 2001 a large number of education policies have had a bearing on the programme. Many education policies in this time have focused on improving attainment, in particular improving mathematical skills and increasing parental involvement, as well as improving the links between communities and schools. This section will give a very brief overview of the background policies which helped shape the project and a few new policies which show the programme's continued relevance today. It will focus particularly on policies which concern the teaching of mathematics and policies which encourage parental involvement.¹

New Deal for Communities (NDC)

Established in 1998 the NDC was the government's flagship programme for social exclusion and worth around £2 billion over ten years. It was funded by the then Office of the Deputy Prime Minister (ODPM). NDC was seen as the key strategy in tackling multiple disadvantage, focusing on issues with health, housing, education, crime and the physical environment. The programme was rolled out to 39 partnerships across England. The key characteristics of the programme were a long term (10 year) engagement, the involvement of the local community and 'joined up' thinking to decide what would work and what would not. The Ocean Estate was one of the areas chosen for such a partnership and the Ocean Mathematics programme was one of the programmes developed with NDC funding. (<http://www.neighbourhood.gov.uk/page.asp?id=617>)

The National Numeracy Strategy and mathematics

In 1998 the National Numeracy Strategy was launched for key stage 1 (KS1) and key stage 2 (KS2) with the aim of standardising mathematics teaching (DfES, 1999). Since then the percentage of 11 year olds achieving level 4 and above at KS2 in mathematics has risen from 59% to 77% (Williams, 2008). The revised National Numeracy Strategy was launched in 2006. The strategy includes a framework for mathematics teaching within a daily lesson for all primary school pupils and argues that one factor which helps to promote 'high

¹ For a detailed description of policies focusing on Parental Involvement before 2005 please see Carpentier and Lall (2005) and Lall, Campbell and Gillborn (2004).

standards in numeracy is if parents are kept well-informed' and encouraged to be 'involved through discussions at school and sometimes in work with pupils at home'.

Improved attainment in mathematics across all key stages is seen as a central pillar of the government's aims for raising achievement. Consequently there has been much focus on increasing the popularity of mathematics. Policies have not only been focusing on schools and pupils. In March 2008 the Learning Skills Council launched the "Get on" advertising campaign in a drive to improve adults mathematics skills through obtaining qualifications.

Whereas traditional mathematics education focuses on memorisation, rote learning, and the application of facts and procedures, the standards-based approach emphasises the development of conceptual understanding and reasoning. A corresponding pedagogical shift has moved the focus from direct instruction, drill and practice, toward more active student engagement with mathematical ideas through collaborative investigations, hands-on explorations, the use of multiple representations, discussion and writing. The educational perspective that views students as being actively involved in building their own understanding is often called "constructivist."

Parental involvement

With regard to mathematics in particular, policies involving parents are a relatively recent phenomenon. The Williams Review interim report (<http://www.heinemann.co.uk/AssetsLibrary/SECTORS/Primary/PDFs/WilliamsReview.pdf>) which focuses on mathematics education has a whole chapter on how parents can help their children achieve better. Parental involvement in general has however been an important feature in recent education policy developments.

The 1998 School Standards and Framework Act introduced a requirement for schools to develop a home-school agreement (HSA) explaining their aims, values and responsibilities, and setting out in turn their expectations of pupils and parents. The latter are invited to sign the agreement.

Since the end of the 1990s the role of parents in their children's education has been increasingly promoted by government policies. However last year saw a significant shift in government policy to a focus on ways in which to promote and foster meaningful parental involvement in their child's education. In *Every Parent Matters* (2007) the Government set out for the first time its agenda for promoting the development of services for parents, both in terms of shaping services for themselves and their children.

(<http://www.teachernet.gov.uk/wholeschool/familyandcommunity/workingwithparents/everyparentmatters/>) It states: 'The government wants to empower parents and shape public services, such as early years settings and schools as a part of its public service reforms.' This was followed (September 2007) by the establishment of the National Academy of Parenting Practitioners whose mandate is to support and train practitioners who work with parents.

These themes are carried forward in the recently published *Children's Plan* (December 2007), with an underlying principle throughout of the key role of parents in their children's lives and the supporting role of government (p69). Although there is no mention of 'parental involvement' in the recent DCSF Children's Plan (<http://www.dfes.gov.uk/publications/childrensplan/>), parents are a central feature of this policy. 'Parents' are mentioned 355 times in 168 pages. The plan builds on the policies developed as a part of the 'Every Child Matters' framework, which started to put children and families at the centre of education policies. The division of the Education Department into

the Department for Children, Education and Families and one called the Department for Innovations, Universities and Skills shows that the logic of putting children, parents and families in the centre of compulsory education provision is being followed through by education policy.

SECTION 2: Literature review

The purpose of this review is to:

- Review how parental involvement is defined in recent literature.
- Focus on the principal theories relating to the effectiveness of parental involvement, specifically in mathematics education.
- Explore the perspectives of schools, teachers, parents and pupils to parental involvement, as portrayed in the literature.
- Draw together suggestions for making parental involvement more meaningful.

For this review we have looked at literature regarding both parental involvement generally in children's education (since 2005²) and parental involvement specifically relating to children's mathematics education. While the majority of research on parental involvement takes a general approach, there is a growing body of research that focuses on parental involvement in mathematics education.

Definition of parental involvement

[M]ost of the literature about parental involvement is not about parent involvement as such, but about parents who are not involved yet or who are not involved in the right way.

Bakker and Denessen (2007)

A growing number of researchers call for a rethink of the traditional "school-centric" definition of parental involvement which ignores the needs and perceptions of the parents that are being encouraged to become involved (Jackson and Remillard, 2005; Knopf and Swick, 2007; Souto-Manning and Swick, 2006). They challenge the tendency for research to define and study parental involvement from the perspective of *school-initiated*, rather than *parent-initiated* (Driessen et al 2005) parental involvement. According to Bakker and Denessen (2007), definitions of parental involvement mainly pertain to model-behaviours of typical white middle-class parents that have proved to effectively contribute to children's school outcomes. Instead, they advocate a broad perspective of parental involvement which includes a variety of parental behaviours that directly or indirectly influence children's cognitive development and school achievement, such as limiting TV watching time for example.

According to Souto-Manning and Swick (2006), the dangers of employing a traditional definition of parent involvement promotes prejudices, further marginalises children and families and fails to validate many parent/family actions that are important to children's well being, such as many rich cultural habits which include the use of visual and oral traditions. They call for a paradigm of parent involvement that values diversity, refutes cultural deficit models and values and respects parents' funds of knowledge.

Likewise, the parent-initiated perspective or broad parent-centric view advocated by Jackson and Remillard (2005) recognises parents' involvement in their children's learning outside of school-sanctioned activities. This includes help from parents with homework, parental inquiry about school matters, availability of so-called cultural capital such as visiting museums, pedagogical rules and aspects of secondary-school choice.

² For a review of parental involvement literature prior to 2005 see Desforges and Abouchaar (2003), Carpentier and Lall (2005) and Seginer (2006), pages 5-26.

Civil and Bernier (2006) argue that the concept of parental involvement that many Americans are familiar with – activities such as encouragement to succeed academically, help with homework or projects, volunteering in the elementary and sometimes middle school classrooms, and participating in governing bodies such as Parent Teacher Associations and other parent networks - are not the only acceptable forms of parental involvement, whether in mathematics or another subject. Civil and her colleagues highlight mathematical practices embedded in the daily activities of low-income, Latino parents and assist teachers and schools in integrating them into the mathematics curriculum.

From the perspective of school/teachers

Parents as obstacles or intellectual resources?

Researchers worldwide have challenged the perception of parents, particularly those from minority groups and from low-income backgrounds, as obstacles to their child's education and reject the deficit model that is often attached to the education of low-income ethnic minorities or working class students. Instead, they advocate an approach to parents as 'intellectual resources' (Civil and Bernier, 2006; Bernier et al, 2003; Civil et al, 2005b; Bouakaz and Persson, 2007; Souto-Manning and Swick, 2006), or as 'funds of knowledge' (Andrews et al, 2005; Civil and Bernier, 2006; Martin-Jones and Saxena, 2003) for their child's education. Indeed, Hyde et al (2006) suggest that parents are a largely untapped resource for improving the mathematics performance of American children, which lags behind the performance of children from other nations.

Research has shown how students in working-class communities, especially in minority households, are often said to be hindered by their parents' low academic attainment (Civil et al, 2005b) with parents' deficiencies being regarded as at the root of their children's difficulties, be they academic or behavioural (Lahdenpera (1997) and Stigendal (2000), cited in Bouakaz and Persson 2007). As such, parents that are not socialised in traditional schooling practices are often viewed as "high risk" for their children's failure (Gee 1996, cited in Souto-Manning and Swick, 2006).

Several initiatives to involve parents in their child's mathematics education have been documented in the literature, notably the IMPACT project in the UK and the Math and Parent Partnerships in the Southwest (MAPPS) in the US. The IMPACT project³ (see Merttens and Vass 1990 and 1993) advocated a 'partnership' between parents and teachers and aimed to involve parents in their child's mathematics learning through specially designed activities for parents and children, which would then be brought back into class to inform the following weeks work.

Rather than focusing on obstacles and deficiencies of parents, Civil et al (2005a and 2005b, Civil and Bernier, 2006) focus on the resources and competencies of parents, viewing them as 'intellectual resources' and seeking to understand the different perspectives that parents have to offer. Through the *Math and Parent Partnerships in the Southwest* (MAPPS), they present a model for parental involvement in mathematics in which working-class Latino parents engage not only as parents, but also as learners, facilitators and leaders.

³ The IMPACT project ran from 1985 to 2004 and was based at the University of North London. It aimed to involve parents in their children's mathematics learning through specially designed tasks and activities. For the last six years of the project, it expanded its work to literacy. For more information see www.londonmet.ac.uk/research-units/archive/ipse/projects/completed-projects/p23.cfm.

Part of MAPPS is a Mathematics Awareness Workshop (MAW), child and parent workshops which are facilitated jointly by parents and teachers. The approach embodied in MAPPS is based on the theory of *funds of knowledge*, a theory that has been drawn upon in numerous literature on parental involvement (see Andrews et al, 2005), in particular in research regarding multi-ethnic and multilingual school settings. The theory of *funds of knowledge* comes from Moll's work with Hispanic families in Arizona (e.g. Moll and Greenberg, 1992, cited in Andrews et al, 2005) and 'refers to the information, skills and strategies which families and households use to maximise their well-being and life chances' (Andrews et al, p3). These *funds of knowledge* can provide strategic resources for classroom practice. The term *funds of knowledge* has also been employed by policy-makers, for example a recent document for teachers of pupils from minority ethnic backgrounds by the Department for Education and Schools (DfES) stated that:

Schools have much to gain from the experiences and understanding of pupils, their families and communities. Drawing on their funds of knowledge enriches a school in a range of valuable ways. (DfES, 2004, p13)

The term has also been used to describe *teachers'* funds of knowledge (Andrews et al, 2005) and refers to a range of skills, strategies and knowledge, both explicit and implicit, which they draw on in their daily classroom practice. According to Andrews et al it extends beyond the professional knowledge associated with being a teacher into areas such as being a part of the local community, being a parent, or sharing an ethnic or religious background. It thus determines the way in which teachers engage with children's parents and home lives in multi-ethnic, multilingual, inner city schools. In the UK, Andrews et al's study of the Home School Knowledge Exchange project,⁴ explores the way in which parents draw on their funds of knowledge (personal and professional knowledge and experiences, and the interactions between these factors) when asked to consider the issues of linking home and school in relation to mathematics learning.

In Sweden, Bouakaz and Persson (2007) highlight research on parental involvement that reveals teachers' distrust of minority parents in urban schools where parents' deficiencies are regarded as being at the root of children's difficulties, including problematical behaviour in school. (Likewise Souto-Manning and Swick (2006) seek to provide an insight into the role of the teachers' beliefs about parent and family involvement, in supporting or inhibiting parent and family participation in partnerships related to the well being of the child and their family.)

Whether parents are viewed as obstacles or 'intellectual resources' has also been addressed within the context of mathematics reform (Gellert, 2005; Peressini, 1998; and Remillard and Jackson's, 2006; Allexsaht-Snider, 2006). An analysis of both specific reform projects (for example Gellert, 2005) and the literature on mathematics reform processes (Peressini, 1998; Remillard and Jackson, 2006) has shown how parents have often been side-lined in many of the recent mathematics reform processes. Remillard and Jackson's (2006) work on how African American parents in a low-income neighbourhood in the US experience, interpret, and respond to reform efforts, shows that the implementation of reform-orientated curriculum tends to disempower these African American parents as players in their children's mathematics education. Gellert's (2005) study of the position parents are assigned to within a prominent German reform project in primary mathematics

⁴ The Home School Knowledge Exchange Project (2001-2004) was a literacy and numeracy project that was piloted in two UK cities, Bristol and Cardiff, and which actively sought to link children's home and school learning contexts. See Andrews et al (2005) for further information.

education,⁵ suggests that in the context of strongly hierarchical power-relations parents are systematically distanced from the process. Parents are asked to restrain themselves from directly helping their children as a way of facilitating the new learning process. As Gellert (2005) explains:

Their knowledge of teaching and learning methods is considered, and depicted, as outdated and no attempt is made to update the parents' understanding. Thus they are no longer able to assess, judge, or give an opinion about the new approach. They become excluded from the process of educational change. (p322)

Peressini (1998) claims that despite increased calls by educational reformers in the US for the inclusion of parents and community members in efforts to improve schools, parents have been denied access to the discourse of the reforms being characterised as obstacles to school mathematics reform. Rather than partners in the child's education, according to Peressini, schools and parents are most often cast as opponents in a struggle for power and influence, with schools believing that parents should support the reform recommendations and programmes determined by professional educators. He warns that excluding parents from the discourse of educational reforms will likely lead to the failure of those reforms and that exclusion of parents in reform processes in mathematics education underway at the time had already slowed progress.

One exception appears to be that of South Africa, where Eloff et al (2006) describe how cooperation between parents and teachers was central to the 2005 new nationwide curriculum which includes educating the parents themselves in the new approach to teaching mathematics.

Reactions of teachers to parental involvement

Several researchers have explored the different feelings teachers encounter when tasked with increasing parental involvement. On the one hand there are studies in the UK and elsewhere that describe how teachers react positively to initiatives that seek to closely involve parents in the school, with teachers engaging in a dialogue with parents (Bouakaz and Persson, 2007; Civil and Bernier, 2006; Patterson, 2006).

In the UK, Patterson's (2006) research shows how head teachers from primary and nursery schools in London viewed increasing parental involvement as key to improving attainment.

In the US, Civil and her colleagues documented the positive experience of teachers involved in the MAPPS project (see Bernier et al, 2003). Teachers participating in the project told them how they welcomed the opportunity for professional development within the realm of reform mathematics, exposure to different teaching methods and approaches, the challenging of their dominant pedagogies and the experience of being learners themselves and thus having an experimental base from which to draw ideas for their own classrooms. They also highlight, however, concerns raised by teachers about the leadership roles taken on by parents in MAPPS, in particular as regards their potential lack of knowledge or skill at being able to teach effectively.

On the other hand, however, Bouakaz and Persson (2007) highlight other studies that point to teachers struggling with this role (e.g. Falkner, 1997, cited in Bouakaz, 2007). They describe, for example, how some teachers feel that this added involvement of others represents a questioning of their role and the placing of undue demands of various sorts on

⁵ A text book *Das Zahlenbuch* which is the first text in Germany to focus systematically on 'active-exploratory learning' in mathematics, i.e. a non-traditional new approach to primary mathematics teaching.

them, which they find difficult to deal with: 'Accordingly, the teachers tend to feel increasingly threatened as parental influence increases, resulting in a conflict between the idea that teachers should be open to the wishes and views of the parents and the idea that teachers should assert their authority and the strength of their own profession' (Falkner, p90).

Indeed, some teachers can see parental involvement as a blurring of responsibilities. As Bouakaz and Persson (2007) observe:

This represents a challenge to the teachers' sense of professional identity and calls into question traditional conceptions of what the central tasks of the teaching profession are. Both teachers and parents are given added responsibilities, teachers in relation to the parents and the parents in relation to the teachers, making it uncertain where the line of demarcation between the responsibilities of the two should be located. (p98)

Effectiveness of parental involvement in children's mathematics education

Numerous researchers have sought to identify those aspects of parental involvement that are most effective in influencing students learning generally (Gellert, 2005; Gonzalez-DeHass et al, 2005; Bailey, 2006) and in mathematics in particular (Cao et al, 2006; Pan et al, 2006; Tsui, 2005; Cai et al, 2003 and 1999; Neuenschwander et al, 2007; Abd-El-Fattah, 2006; Aunola et al, 2003). Contributing factors to children's mathematical achievement range from parental expectation (Neuenschwander et al, 2007; Tsui, 2005; Chen et al, 1996; Cao et al, 2006; Mau, 1997); students' perception of parental involvement or influence (Abd-El-Fattah, 2006; Cai et al, 2006; Cao et al, 2006); parents' beliefs in their child's competence (Aunola et al, 2003) or parental involvement in interactive homework activities (Bailey, 2006; Hyde et al, 2006). Others look at the issue through a gender lens, focusing on the impact of the mother-child relationship on the child's achievement (Simpkins et al, 2006) or how the parent and child gender interact with parent involvement to affect adolescents' academic achievement differentially (Lee, 2007).

Gellert (2005) argues that there is empirical evidence to show that the preparation and support pupils receive from their parents are decisive factors in their educational achievement within the first school years. Abd-El-Fattah's (2006) research in Egypt showed that students' perception of parental involvement factors was the most important predictor of academic achievement, followed by parents' education, and finally school disengagement. Yet others focus on the increased motivation for learning that students have as a result of parental involvement (Gonzalez-DeHass et al, 2005).

The majority of these researchers appear to agree that parental expectation plays an important part in the mathematics achievement of their child (Neuenschwander et al, 2007; Tsui, 2005; Chen et al, 1996; Cao et al, 2006; Mau, 1997). Civil and Bernier's (2006) research also suggests that children's learning opportunities are likely to be framed by what their parents think and expect.

According to Bailey (2006) increasing student learning through meaningful parent-child interaction during the completion of homework has emerged as a significant variable for improving learning for low-performing students. As pointed out by Hyde et al (2006), however, informal mathematics learning in the home has received little research attention. Bailey's (2006) research in the US on the role interactive homework can play in fostering parent-child interactions and improving reading learning outcomes for at-risk young children suggests that Interactive Homework Assignments (IHA), if accompanied with short-term specific parent training, has the potential for improving academic performance for academically at risk students.

Hyde et al (2006) emphasise the importance of the quality of involvement over the quantity of involvement, making reference to parental involvement studies which have shown a negative impact of parental involvement in homework (Elder, 1997; Cooper, 1989; Gauvain, Fagot, Leve and Kavanagh, 2002, all cited in Hyde et al, 2006). She suggests that the quality of involvement can be measured in terms of the quality of *scaffolding* which can be positively related to the child's subsequent performance (see Hyde et al, 2006, for information on scaffolding). She suggests that deficiencies in scaffolding variables can be remedied by school-family partnerships.

Involving parents interactively in their child's homework, while not common, is far from new. In the US Epstein (2001) designed an interactive homework system called the Teachers Involving Parents in Schoolwork (TIPS),⁶ a tool for encouraging students to work interactively with their parents on their mathematics, language, art and science homework. The homework requires that students articulate their understandings to their parents; that parents and children work together to apply skills to everyday situations and provides the space for parents to share their insights and problem solving strategies with their children.

From a cross-cultural perspective

Many researchers within this group have taken a cross-cultural perspective, seeking to uncover the causes of cross-national performance differences in mathematical performance. The majority of comparative cross-cultural research appears to have been carried out on students' learning of mathematics in the U.S. and China (Cai et al, 2003 and 1999; Tsui, 2005; Chen et al, 1996; Pan et al, 2006), with one study comparing perceived parental influence on students' mathematics learning in China and Australia (Cao et al, 2006). Cai's (2003) research of Chinese and US sixth-grade students and their parents showed that parental involvement is closely related to students' mathematical achievement. In her study Chinese parents seemed to play a more positive role than their US counterparts. Her research showed that, of the five roles she identified for parents - as motivators, resource providers, monitors (indirect assistance), content advisors and learning counsellors (direct assistance), two of the indirect assistance roles of parents – motivators and monitors – seemed to be the most important predictors. Cai et al's (1999) study also showed that students with the most supportive parents not only exhibit high mathematics proficiency and performance levels, but also have more positive attitudes towards mathematics than do students with least supportive parents.

Likewise, Pan et al's (2006) comparison of parental involvement of American and Chinese mothers in the mathematics learning of their five and seven year old children showed that the Chinese children outperform their American peers in mathematics. They also emphasise the importance of the nature of involvement concluding that the specific mathematics knowledge that parents teach appears to be more important than the amount of time parents are involved in their children's number learning.

Again, it is important to note that several studies found parental expectation to be the most decisive factor in parental influence over their child's mathematics achievement. Chen et al (1996) and Tsui (2005) found that students in China had higher achievement levels in mathematics than their American counterparts. They both found that Chinese parents had higher expectations of their children's performance. In their studies, Chinese parents talked more frequently about school with their children (Tsui, 2005) and Chinese parents spent

⁶ See Epstein et al (2001) and <http://www.csos.jhu.edu/P2000/tips/index.htm>.

more time helping their children with homework than their American counterparts (Chen et al, 1996). In addition, however, Tsui (2005) recognised that an array of other factors impact the mathematics achievement of Chinese students. These include the societal emphasis on education, well trained elementary and secondary school mathematics teachers, high parental expectations and children's willingness to work hard on mathematics. Several studies discuss the influence of the attitude towards mathematical aptitude. Pritchard (2004) for example points to the social acceptability of being mathematically poor in the US. Similarly Williams (2008) points out how 'the United Kingdom remains one of the few advanced nations where it is socially acceptable – fashionable, even – to profess to an inability to cope with mathematics.

Cao et al's (2006) study of Perceived Parental Influence (PPI) on students' learning of mathematics in China and Australia found that PPI decreased as year levels increased in both countries and that Chinese students had significantly stronger perceived parental encouragement and perceived parental educational expectation than their Australian peers. Cao et al's (2006) explanation for this may reflect an immigrant phenomenon, a strategy used for achieving upward social mobility by immigration groups, i.e. where English is not the first language, parents realise there are greater difficulties for them to achieve success in their new society and therefore recognise that education is vital for success. As a result they strongly encourage their children and have high expectations of them.

Other literature seeks to give a voice to members of ethnic minorities, in particular to those sectors of society that have been socially, politically and educationally marginalised: in the US the voices of low-income African American parents (Martin, 2006; Remillard and Jackson, 2006), Korean mothers (Sohn, 2006) and Latino families (Civil et al, 2005b); in Spain, Pakistani, Moroccan, Bangladeshi and Dominican parents (Civil et al, 2005b); and in Sweden, families of Arabic background (Bouakaz and Persson, 2007).

From the parents' perspective

In line with the call for a more "parent-centric" definition of parental involvement, an increasing number of researchers have explored the way in which parents themselves view their own involvement in their child's mathematics education. Research has examined different factors that prevent parents, in particular low-income immigrant and minority or working class parents, from engaging meaningfully with their child's mathematics education. These include time limitations due to work commitments (Remillard and Jackson, 2006; Peters et al, 2008); language barriers (Civil et al, 2005b; Bouakaz and Persson, 2007; Sohn, 2006); the discontinuity many parents experience between the mathematics they learnt at school and how their children are taught today (Pritchard, 2004; De Abreu and Cline, 2005; Remillard and Jackson, 2006; Civil et al, 2005b), parents' lack of school capital (Bouakaz and Persson, 2007) which makes it difficult for parents to know how to advocate for their child's education; the feeling of inadequacy due to perceptions of their own ability, their own tainted experience of mathematics at school and some parents lack of formal mathematics preparation (Civil et al, 2005a and 2005b; Civil and Bernier, 2006; Remillard and Jackson's, 2006).

The majority of research that focuses on parents' perspectives appears to have been carried out in the US (Remillard and Jackson, 2006; Civil et al, 2005a/b and Civil and Bernier, 2006; Martin, 2006; Sohn, 2006) and the UK (Peters et al, 2008; De Abreu and Cline, 2005; Reay, 1998) with other studies in Sweden (Bouakaz and Persson, 2007), Cyprus (Georgiou, 2007) and New Zealand (Pritchard, 2004).

In the UK, Peters et al (2008) present a relatively positive picture as regards recent trends in parental involvement in children's education. Their survey of over five thousand parents and

carers of children revealed that parents felt more involved in their child's school life, with 51% stating that they feel very involved in their child's school life compared to 29% in 2001. One in three parents said they always help with homework (26% said they mostly help with homework). Three out of four said they felt confident always or most of the time when helping children with homework. The main reason for parents' lack of confidence was changing teaching methods and a lack of understanding of their child's work. Two out of three parents said they would like to be more involved in their child's education. For 44% of respondents, work commitments were the main barrier to greater involvement in their child's education.

De Abreu and Cline (2005) explore parents' representations of their children's mathematics learning in multiethnic primary schools in the UK, specifically interviewing parents of Pakistani and White origin. Their interviews revealed that parents held distinct representations of their own mathematics and the 'school mathematics' of their children, with some ensuring that some representations (such as the multiplication tables for example) were passed onto their children; some trying to *conceal* their methods from their children so as not to confuse them; and others, in particular in cases of highly achieving children, who made an effort to learn about methods their child was being taught to tackle specific tasks. It was in such cases that some parents were prepared to have children as co-teachers to help them. Their research showed some indication that in both cultural groups, parents of low achieving children had more difficulty in bridging the gap between their own mathematics and that which their child is being taught at school. Interestingly, their study challenges the traditional emphasis on discontinuity for minority groups between home and school and cultural continuity for mainstream groups. In their study, like the Pakistani (immigrant) parents, the White British parents also experienced unsettling changes between the mathematics they themselves had learned at school and the different teaching methods used for their children.

Patterson's (2006) research of a parental involvement project in a UK primary school explores the barriers parents face in getting involved in their child's education. She found that helping their child with their homework was the biggest issue for parents.

Reay's (1998, cited in Civil, 2006, p314) study of immigrant mothers' involvement in their children's schooling in two London primary schools underscored the difficulties that many of them encountered as they tried to build on their cultural capital for their children's benefit. Their experiences with schooling were so different to what their children were experiencing in their new country that their cultural capital was of little use in their current situation.

In the US, Sohn (2006) explored the difficulties – including linguistic and cultural barriers, feelings of discrimination, and limited school support - experienced by immigrant Korean mothers of fourth grader children in the US.

Remillard and Jackson's (2006) study of African American parents in a low-income neighbourhood illustrates the disconnect some parents experience both between their child's school mathematics and the mathematics that they were taught at school, and the mathematics that they use in their daily lives. Indeed, the recent shift to an emphasis on developing conceptual understanding and reasoning is new to most parents who are products of a school system that previously emphasised memorisation, rote learning and the application of facts and procedures. According to Remillard and Jackson most of the parents found the new approach to mathematics instruction more confusing than what they experienced as students and thought that the added complication was unnecessary. Their interviews showed, however, that while the new curriculum was confusing in places, most of the parents made substantial efforts to understand the curriculum and gather resources that

would help them support their children, despite the fact that they were provided with minimal support to do so.

Martin's (2006) research with African American parents shows how mathematics learning and participation can be conceptualised as *racialised forms of experience*. He describes how some parents come up against discriminatory experiences as they attempt to become doers of mathematics and advocates for their children's mathematics learning, while others resisted their continued subjugation based on a belief that mathematics knowledge, beyond its role in schools, can be used to change the conditions of their lives.

Civil et al's (2005b) research on Latino immigrant parents' perspectives on their children's mathematics education also point to "their moving across two different frames of reference in terms of educational systems – that of their country or origin (the "before") and that of their new country (the "now")". They found that parents' reactions to the different approaches to the teaching and learning of mathematics varied from acceptance and trying to adapt to the new system to experiencing some form of conflict. The fact that they 'possess cultural capital of a different currency' (Vincent, 1996) means that their own habitus does not allow them to interfere. Parents who are unfamiliar with the mathematical content that their children are learning and with the rationales behind the reforms, according to Peressini (1998) are probably less inclined to be able to substantially support their children's mathematical learning other than in the form of "monitoring" (p575).

Civil et al (2005b) also give an important insight into the interplay between the teaching of mathematics and the role of language for immigrant parents. In their study of immigrant Latino families in the US many/some parents expressed frustration at not being able to help their children with homework because of the language barrier, with some children having to translate the problems to their parents in order for them to be able to help. This situation requires proficiency in the mathematical register of two languages which the children often do not have.

In Sweden, Bouakaz and Perrson (2007) argue that without school capital (the amount of educational knowledge and knowledge of the school system and its practices) and a network of relationships that introduce the parents to the school, minority children's parents will remain excluded from the work of the school: 'Parents with limited social capital and lack of cultural and economic capital often display a sort of resignation, not because they have stopped loving their children or stopped caring for them, but because they are afraid of getting involved in the wrong way, such that it could cause more harm than good for the child' (p98), as such parents tend to delegate everything that concerns their children's school to the teachers declaring "The school is the business of the teacher".

Indeed, for many of the parents of Arabic background in their study it is regarded as very "shameful" to interfere with the work of the teachers. As such Bouakaz and Perrson (2007) argue that 'it is probably more likely that parents with low social and cultural capital put too much trust in school and the teachers' (p99). However, they also point to situations where, due to the lack of knowledge of the school and its educational practices, the parents may try to protect their children against the school, especially regarding moral values and religious beliefs, which they often feel the school does not assign sufficient importance to. They believe it is the latter which explains why minority parents put their energy and hope to supplementary schools. Indeed their research showed that Arabic parents can have quite different views to teachers of how their involvement in their child's education should be expressed. They encountered parents who may not have much contact with the school, but who may consider the roles they play outside of school – such as supporting their child's

attendance at supplementary schools or belonging to associations that arrange activities for their children – to be forms of parental involvement in the education of their children.

Starkey and Klein's (2000) study of parental involvement interventions with Head Start Families in the US demonstrated that low-income parents were willing and able to support their children's mathematical development once they were provided with the training to do so. For Bouakaz and Persson (2007) the fact that the parents in their study were willing to help develop a good working relationship with the teachers clearly demonstrates how much the parents care about their children, just as any other parents in the country do. They simply lack the tools to develop such a relationship easily. Similarly, Georgiou's (2007) research in Cyprus showed that where parents attributed their child's achievement to internal and controllable factors such as the parent's own effort, the value they attributed to getting involved was stronger. If they believed their involvement to be important, according to Georgiou, they will find ways to get involved.

The widely accepted 'can't do' attitude (Williams, 2008; Pritchard, 2004) of some parents is also relevant here. As Williams (2008) writes, 'If parents believe they cannot understand mathematics, they have little incentive to act or to persevere in the face of difficulties with their children's learning, and they are unlikely to pass on a positive attitude' (p69). With this in mind he recommends that 'those working with parents and children need to be aware of this pervasive negativity and start thinking about how to reverse it' (p69).

Within the literature on parental involvement there are few studies that touch on parental involvement from the child's perspective. What does exist offers different perspectives. In the UK, De Abreu and Cline (2005) highlighted cases where children view their parents' strategies as old-fashioned and therefore of lower value. In his review of mathematics teaching in early years settings and primary schools in the UK, Williams (2008) revealed that many children would like their parents to be taught the methods they are learning in mathematics, methods which have changed considerably since their parents were at school. Williams (2008) believes that this makes it difficult for parents to support their children and 'the lack of clarification and setting out of the methods of teaching is a missed opportunity for engaging parents and improving their children's attainment' (p69).

Suggestions for making parental involvement more meaningful

Critical to any approach is highlighting the link between home and school. As Bouakaz and Persson (2007) write:

The important thing was felt to be that of showing the children and the parents how things done in school and things done at home correspond with and influence each other, emphasising the fact that the school and the home should not be regarded as two separate worlds.

Within the call for a redefinition of parental involvement, several researchers highlight the need for teachers to receive specific training regarding strategies to facilitate meaningful parental involvement, in particular with regard to parents from very different sociocultural backgrounds (e.g. Driessen et al, 2005; Bailey, 2006). Several researchers have also presented specific recommendations for developing effective strategies for parental involvement (Carlisle et al's, 2005; Herman and Swick, 2007; Patterson, 2006).

In terms of early years schooling, according to Swick (2004, cited in Herman and Swick, 2007), early childhood programs need to offer more parenting education, provide essential support for families that enable them to be a part of quality involvement efforts, and seek

and create more diverse pathways for family involvement to occur. For them, capitalising on family strengths in developing positive and empowering relations with families is key.

Involving teachers in projects which have as their theoretical grounding a view of parents as intellectual resources also provides professional development opportunities for teachers. Indeed, several writers advocate a view of parents as 'serious educational partners' (Driessen et al, 2005) or as 'co-educators' (Patterson, 2006) and call for partnerships between parents and teachers that expand the roles for parents to more than just homework helpers or people to be blamed for children's failures. Driessen et al (2005) call on teachers to break away from *request situations* in which parents are occasionally called upon to lend a helping hand and schools occasionally help parents at home – to an *interaction situation* – in which teachers, parents and schools exchange ideas as equals with regard to the children's education.

Patterson (2006) suggests that schools should assist parents in challenging the deficit views of the culture of their home communities and rather develop a programme using homework to help extend the home learning environment based on parents as 'co-educators'.

Conclusion

The above literature review clearly demonstrates the global nature of interest in parental involvement in mathematics education. It reveals a growing call for a fundamental change in the way parental involvement is viewed: from a "school-centric" interpretation where parents are viewed as obstacles to their child's education, to a "parent-centric" approach in which parents are seen as intellectual resources and their funds of knowledge as a source of richness for their child's mathematics education. Both academic and policy interest in the issue of parental involvement has continued to grow over recent years, as evident in the literature review, particularly in the US, but also in Europe, notably the UK but also in Sweden and Germany. A growing number of researchers continue to explore the cross-cultural differences between different countries, notably that of Chinese and American students, but also within countries, such as between Asian or Latino students and their American peers.

While there is widespread recognition that parental involvement in children's mathematics education is beneficial, there is considerable debate around what type of parental involvement is most effective, be it indirect or direct assistance, school-initiated or home-initiated involvement. The importance of parental expectation appears to be particularly important.

We believe the Ocean Mathematics Project (OMP) provides an excellent case study to explore these issues further. It provides compelling evidence of how an initiative grounded on a vision of parents as intellectual resources, and one which values parents' funds of knowledge, can lead to visible improvements not only in children's mathematics ability, but also to parents' own learning and teachers' own professional development. The subsequent review will reveal the way in which the OMP has been successful in transferring to parents the methods used to teach their children mathematics, which in turn has served to transform the way in which parents can engage with their child in their mathematics learning.

SECTION 3: The Ocean Mathematics Project

3.1 History of the project

The Ocean Mathematics Project came into being in 2001. The aim of the project was to help children in one of the most disadvantaged areas in the country: a large post-war housing estate in Stepney, East London, called the Ocean Estate. The project sought to address underachievement in mathematics by changing the attitudes and practices of schools, parents and children, specifically through involving parents in their child's mathematics learning process.

The Ocean Estate

As one of the most deprived housing estates in the UK in 2000 the Ocean Estate was selected for a 10 year New Deal for Communities (NDC) regeneration plan. The estate is characterised by widespread deprivation, economic inactivity, poor health, low education attainment and poor housing. The area has a high BME population, with over 90% of Bangladeshi origin.

The majority of the children and parents involved in the Ocean Mathematics Project (OMP) are from the local Bangladeshi community, followed by the Somali community. The OMP has provided interpretation into Bengali, including the local dialect Sylheti used by many in the area, and where necessary materials are translated into Bengali (see www.ocean-maths.org.uk). The project has also involved local BME individuals and groups to deliver some aspects of the project, such as community outreach, crèche support and assistance in workshops. In the early days of the project, community ambassadors were also used to gain access to 'hard to reach' parents and community organizations such as the Ocean Somali Community Association (OSCA).

The impetus for the project came from the schools themselves who were concerned with serious underachievement in mathematics. Familiar with the numeracy work of the IMPACT mathematics development programme (see page 13), the schools approached the University of North London. With Ocean New Deals for Communities (NDC) funding, the University of North London managed and delivered the project for the first six months. Unable to deliver the project further, they pulled out in late 2001 and the London Borough of Tower Hamlets took over the management of the project. As detailed in Bastiani's (2002) initial review, the project subsequently

went through a period of administrative difficulties, including a lack of clear input from the Ocean NDC, staffing issues and a lack of effective project management and coordination.

The project as it is known today was approved in mid 2002. An experienced education consultant with a specialism in mathematics was appointed as project manager and a steering committee was created. Today, in addition to the project manager, the project team has three main members of staff and up to 19 sessional workers including outreach workers, interpreters, crèche workers and a consultant who delivers workshops in primary schools.

While the main funding for the project has come from the Ocean NDC, additional funding also came from the Neighbourhood Renewal Fund (NRF) (since 2006), the London Borough of Tower Hamlets and, for the OMP pilot project for foundation stage, from Sure Start.

The project began by delivering mathematics workshops to parents and giving pupils specially designed homework, part of which included a mathematical game to play with their parents.

Initially the workshops were held at community venues in the evenings. Today, however, all workshops take place in the schools – usually in the main hall in the primary schools, in the

mathematics class room in the secondary schools, and divided between 'carpet time' and playtime in the foundation stage.

3.2 Scope of the project

From five schools – three primary and two secondary – in 2001, today the Ocean Mathematics Project is being implemented in 27 schools, 22⁷ of which are outside the Ocean Estate. The 27 schools are comprised of 18 primary schools, seven secondary schools and two special schools. A list of these schools can be found in appendix I.

After successfully piloting the Ocean Mathematics workshops at the foundation stage in 2005-2006 (see Pound, 2006) the workshops have since been rolled out to seven different schools.

Plans for 2008 include three confirmed clusters of schools (of between five to six primary and secondary schools) in two additional London boroughs and several potential clusters across the country.



Grandfather, grandson and friend participating in an Ocean Mathematics Project workshop © OMP

⁷ While Redlands primary school and Central Foundation secondary school are both physically located outside the Ocean Estate, because the majority of their pupils come from the Estate they were eligible for funding.

SECTION 4

4.1 The review

The purpose of this review is to focus on the spread of the project, making reference to the baseline drawn from two previous evaluations (2003 and 2005) by the Institute of Education in which the OMP was reviewed (Carpentier and Lall, 2005; Lall et al, 2004 and Lall and Gillborn, 2003). It also aims to evaluate the project's school based work and to identify the 'lessons learned' to date. The review will focus in particular on the parental involvement aspect of the project, but also look at how the project has changed school and teacher practice. It will endeavour to draw lessons from the project about how best to support and develop parental involvement in children's mathematical education at both primary and secondary school level. As part of the analysis the review will also present the perspectives of the project's key stakeholders: the children, the parents, the teachers and the schools. It will also highlight best practice, make suggestions for maximising the effectiveness of the project and outline key indicators for the project's success. Lastly, it will look at the future of the Ocean Mathematics Project, review the project's current framework for its future work as a social enterprise and make suggestions on how to address potential future challenges.

4.2 Methodology

The review is based on information from workshop observations (see appendix II), interviews with OMP team staff and interviews with school staff, parents and pupils in the following schools:

Primary schools	Secondary schools
Halley, year 3 and foundation stage	Stepney Green Maths and Computing Specialist College, year 7
Redlands, year 6	George Green, year 8
Cayley, year 1	St Paul's Way*
Guardian Angels, year 4	
Ben Jonson*	

* Workshops were not observed in these schools.

All schools are located in the London borough of Tower Hamlets. Halley, Cayley and Stepney Green schools are located on the Ocean Estate.

An Ocean Mathematics workshop was observed in each of the schools in the year group indicated above. Separate focus groups were carried out for parents and children. In each school individual interviews were carried out with the mathematics coordinator and class teachers (primary school) and heads of mathematics and mathematics teachers (secondary school) involved in the delivery of the workshops. In Cayley and George Green the head teacher was interviewed and in Stepney Green and Ben Jonson the Deputy Head teachers were interviewed. In George Green a teaching assistant was also interviewed. At St Paul's Way a training session for teachers was observed. All interviews have been anonymised.

A questionnaire was also distributed to parents, pupils and teachers involved in the OMP in eight schools, six primary and two secondary,⁸ in order to obtain a wider sample of views. Forty-six teachers answered the questionnaires (48% return rate); 105 parents (8% return rate) and 1045 pupils (40% return rate). The tight time frame for distributing and collecting

⁸ Questionnaires to parents were only handed out in four schools, two primary and two secondary.

the questionnaires, coupled with the Easter holidays meant that fewer questionnaires were returned, especially by parents, than envisaged. In addition, the questionnaires were also distributed when the vast majority of the term's workshops had already taken place, meaning letters had to be sent home, a method which often achieves a low response.

This information was supplemented by documentary analysis, the project team's own monitoring documentation and the Ocean Mathematics website.

4.3 Baseline

In 2003 and 2005 the Institute of Education carried out two reviews which featured the Ocean Mathematics Project. In 2003 the Institute of Education carried out research into several New Deal for Communities (NDC) initiatives aimed at raising the level of educational attainment. In 2005, they looked at the OMP as one of several successful initiatives regarding parental involvement practice for 'hard to reach' parents.

The 2003 review found:

- Involving parents in children's school life has positive effects on attendance, pupil enthusiasm and learning.
- The OMP is already having ripple effects, such as improving homework, in other subject areas.
- Success of the project was in part due to the fact that the community (schools) requested the project and the residents had started to 'own' the projects.

The 2005 review found:

- The OMP was the most extensive parental involvement project on offer across London LEAs.
- The OMP was successful in developing parental involvement in light of pupil achievement in a holistic way, meeting the needs of the pupils, parents and teachers.
- The project's success could be attributed to its close collaboration with the schools and the extent to which the project had become integrated within the schools, the OMP's ability to resolve teachers' concerns regarding workload and boundaries between school and project time, and the motivation of the people involved in the project.
- The role culturally sensitive outreach workers play in building the bridge between parents and schools is crucial, as is an awareness of the community's needs and a cultural sensitivity when adapting any existing project.
- It is important to take into account these key ingredients when replicating the project elsewhere. Links between project and school activities should be well-defined and responsibilities of those involved clear from the out-set.

Bastiani's (2002 and 2004) reviews focused on the OMP. The project's challenging beginnings have been documented in his initial review of the project (2002). The way in which the project was transformed through the dedication and determination of its Project Manager was clearly documented in Bastiani's follow up review (2004): *"Now, almost exactly two years later, the transformation of the project is immediately apparent and obvious – to everyone. I found an established project which is functioning strongly and effectively, much admired and a source of both commitment and pride for all who are involved in its work"*.

The 2004 Review's main findings were:

- There is consistency and continuity of project management and school leadership.
- Rates of parental participation are high.
- The workshops provide a model for out of school and family learning.

- Strong features of the project are continuous review, formative evaluation and systematic improvement.

Its key recommendations included:

- Develop effective ways of targeting fathers and other male carers.
- Use case studies to determine influence on children's attitudes, behaviour and achievement, including comparisons between project and non-project pupils to assess benefits of parental involvement. Track cases where involvement in the OMP has led to wider participation in school affairs or encouraged further development.
- Recognise and respond to the cumulative demands the project makes on parents of large families.

SECTION 5:

5.1 Aims, outcomes and lessons learned

Aims and design of the project

The project's original aims sought to bring about improvements in:

- Parents' confidence and participation in children's learning and progress; parents' own learning and participation in the life and work of the schools;
- Pupils' attitudes, behaviour and progress, shown in their approach to homework; their attitudes to mathematics and their confidence as learners;
- The life and work of schools in relation to mathematics teaching; staff attitudes and sharing of good practice; assessment, recording, reporting of progress in mathematics.

The project aims to increase attainment in mathematics for years 1 to 9, in particular at KS2 and KS3. Since the pilot in 2005-2006, the project has also spread to the foundation stage with seven primary schools now delivering workshops in reception classes. The project combines management of the provision of homework with supporting workshops for parents, pupils and teachers.

The project uses specially designed homework that focuses on a game that children and parents or carers can play together. This supports the learning that has gone on in school and encourages 'mathematical talk'. In primary schools children have a workshop each term to which their parents are invited to; in secondary school children have a workshop once a year. During workshops parents and children are shown how to play the games and suggestions are made as to other ways in which they can support their child. Parents also have the opportunity to discuss issues with each other and staff from the school and the project. Pupils are given Ocean Mathematics homework every two weeks; five per term.

The OMP's teaching methods and use of interactive games and paired talk reflect a recent policy shift as outlined in the Primary and Secondary National Strategies and the renewed Frameworks whereby significant emphasis is placed on developing conceptual understanding and reasoning.

The OMP has taken place against a backdrop of a growing recognition by Government of the importance and value of involving parents in their child's education. Last year saw a significant shift in government policy to a focus on ways in which to promote and foster meaningful parental involvement in their child's education. In 2007 in its *Every Parent Matters* (March 2007) document the Government set out for the first time its agenda for promoting the development of services for parents both in terms of shaping services for themselves and their children. This was followed by the establishment of the National Academy of Parenting Practitioners (September 2007) whose mandate is to support and train practitioners who work with parents. As highlighted by Williams (2008) these themes are carried forward in the recently published *Children's Plan* (December 2007), with an underlying principle throughout of the key role of parents in children's lives and the supporting role of government (p69). Taking forward the Children's Plan, in 2008 the *Parent Know How*⁹ government initiative was launched which aims to improve the provision of information and support for parents via a variety of communication means: the web, phone, text and instant messaging.

⁹ See for example *Kids don't come with an instruction manual – Ed Balls hosts childrens plan debate*, press release, Department for Children, Schools and Families. 8 March 2008.

While the OMP has no specific links with these above initiatives, it has served as an important test case at the local level for the effectiveness of parental involvement in their child's mathematics education. Indeed, there is evidence that the OMP model has been copied and implemented in schools in the local borough.

5.2 Evaluation of operation and outcomes

Successes

From uncertain beginnings the project has gone from strength to strength. In 2005 the project received the Office of the Deputy Prime Minister's Educational Award¹⁰ in recognition of its success. More recently, the project was praised in Williams' (2008) Interim Review of Mathematics Teaching in Early Years Settings and Primary Schools. The OMP was included as an example of current good practice of parental involvement in children's mathematics education:

The most successful educational settings are embracing these principles already. These settings are usually within a local authority which is committed to championing parenting work. For example, the excellent work of the Ocean Maths Project in Tower Hamlets, London is noted (p70).



Project Manager, Pinder Singh (middle) is awarded the Office of the Deputy Prime Minister's Education Award by Baroness Kay Andrews. 2005 © OMP

While the OMP does not claim credit for improvements in attainment levels in mathematics - as the OMP is just one of numerous initiatives to tackle underachievement in mathematics - this review suggests that the OMP can play a significant role in raising achievement in mathematics. As evident in appendix III, the majority of schools that have been implementing the OMP for several years have witnessed improvements in both KS2 and KS3.

The impact on attainment levels has been perhaps most evident in two of the original participating schools, Cayley Primary School

and Stepney Green Secondary School (see page 49).

In addition to improvements in achievement, however, over the years a myriad of wider benefits have become increasingly evident. These include improvements in parents' own

¹⁰ The award states: The project is so successful that it is being copied by other schools in the Tower Hamlets area with the long term aim of it being developed into a social enterprise so that it can continue for many years to come...[The] Ocean Maths Project has not only raised the attainment levels but also encouraged parents to be more involved in their education. Furthermore the project has also acted as a way to educate adults in basic maths skills which increases confidence and parental involvement in their children's education. See New Deal for Communities and Neighbourhood Management, 2005 Awards (Education Award). Office of the Deputy Prime Minister.

mathematics understanding; the *transfer* of methodology from teachers to parents; improved parent-teacher as well as parent-child relationships; teachers' own professional development and increased parental involvement in school life and in their child's education generally. In some schools the impact of the project has been so successful that the principles and methods of the project are now being used to improve other parts of the school curriculum. For example, Stepney Green Maths and Computing College piloted parent and child workshops for Science based on the OMP model. From almost no parental involvement prior to the OMP, another school has between three to four activities a week for parents on a wide range of issues.

Contributory factors to OMP's success

A variety of factors have contributed to the success of the OMP. It is a combination of all of these factors that has made the OMP the success it is today.

- The **professionalism, dedication and commitment from the OMP team**, in particular the Project Manager. This has enabled the project to develop high quality training models and homework materials.
- **Commitment to involve all the key stakeholders.** The Project Manager's unremitting dedication to continuously consult *all* stakeholders (schools, teachers, parents and pupils) and fully integrate their views and perspectives throughout the evolution of the project. This in turn has created a feeling of ownership for all involved.
- The **flexibility** of the OMP team to cater to the specific needs of the school, the parents and the pupils. For example, in the setting up of special booster Ocean Mathematics workshops for GCSE borderline students.
- **The adoption of OMP as an integral part of school practice, in line with National Numeracy Strategies.** This is crucial to ensuring the longevity of the project. Not only are the homework and workshops fully integrated into the curriculum and National Numeracy Strategies (primary and secondary),¹¹ both in the sense of key objectives and the emphasis on a more game-based and interactive approach, but the OMP appears to be fully embedded into participating schools' policies, development planning cycles and priorities. Staff training and support has also been fully integrated into the mainstream life and work of participating schools. Indeed, while observing workshops and speaking to teachers in schools that had recently introduced the OMP it was clear that the heads of mathematics/mathematics coordinators were fully committed to teachers taking ownership of the workshops and fully integrating it into their teaching.
- **The recognition of different abilities.** While being able to cater to pupils' different mathematics abilities was clearly an issue at the beginning of the project, especially in mixed ability classes, significant effort has been taken to make both the homework and the workshops flexible enough to respond to these differing abilities. For example, secondary Ocean Mathematics homework has four different versions for each year group; extension, core, support and booster. Primary school (years 1-4) homework also has a simpler version. In terms of the workshops, according to OMP the exercises are designed so that any pupil in the year group should be able to respond. It is rather the child's mathematics ability that will determine the way in which the child responds to a particular exercise. Teachers are trained to think creatively of ways in which exercises or

¹¹ In 1998 the National Numeracy Strategy was launched for KS1 and KS2 and in October 2006 the renewed Primary Framework for Mathematics was launched. In 2005 the Secondary National Strategy for School Improvement replaced the KS3 National Strategy. Central to these strategies are the associated renewed Frameworks. The Secondary Framework for KS3 and KS4 covers English, mathematics, science and ICT. The Primary Framework covers literacy and mathematics. See www.standards.dfes.gov.uk

games can be adapted to cater to the differing abilities of children through devising 'extensions' or 'simplifications'. The success to which this is done seems to depend on the individual teacher. During the workshop observations, Redlands Primary School suggested several ways parents could adapt the exercises to make them more challenging. Perhaps what is more challenging is catering to the different abilities of parents. Some teachers have explored ways in which to further engage parents in the learning process. In Halley Primary School, for example, parents were given an optional exercise to try at home.

- **Support from senior leadership.** Having senior leadership on board is critical to the project's success, both in terms of the profile the project is given within the school, the time (including supply cover) teachers are given to plan for workshops and attend training sessions, and the resources dedicated to the successful delivery of the workshops.
- **Space.** It is essential that there is sufficient space for workshops to take place, whether it be the mathematics classroom or in the main hall. According to the OMP, one secondary school had to stop delivering workshops as they could no longer use the main hall to do so. This is often a prohibiting factor when schools wish to carry out more workshops, or roll out the workshops to more year groups.
- **Having experienced mathematics coordinators or heads of mathematics.** Having an experienced mathematics coordinator or head of mathematics who takes ownership of the project and takes a lead on ensuring all the logistics are organised etc, was identified as essential.
- **Good publicity and outreach work.** It is essential that parents receive well presented information about the workshops. This usually involves a letter sent home with the child for their parent. In one primary school, children themselves write to their parents asking them to attend a workshop. Until the workshops have been established as an expectation by the parents, it is essential to have outreach workers or home liaison officers call the parents the day before to remind them of the workshop and to reiterate how important it is that they attend. It is important that whoever carries out the outreach can speak the language of the parent, is culturally sensitive and knows the OMP well. The possibility of training assistants to carry out outreach work with parents could be explored.¹²

Obstacles experienced by OMP

The problems identified in previous evaluations have largely been overcome. Initial problems around staffing and lack of effective management have been solved by the appointment of a very experienced and committed Project Manager and her team.

The mis-fit identified at the beginning of the project between the Ocean Mathematics homework and the mathematics teachers were delivering in class in line with the National Numeracy Strategies was resolved through listening and taking on board teachers concerns and comments and adapting the homework accordingly.¹³ Listening to and acting upon teachers concerns further strengthened teachers' sense of ownership of the project and bears further testament to the project's ability to respond to the needs and concerns of its

¹² For example, the Manchester Transition Project, a programme aimed at training and supporting primary school staff in working with parents, has successfully trained teaching assistants to carry out outreach work with parents. For more information see, Dyson, A, (date unknown), 'The Manchester Transition Project: Implications for the Development of Parental Involvement in Primary Schools', Research Report RW95, Department for Education and Skills.

¹³ For example, the key objective on each Ocean Mathematics secondary school homework is directly linked to the sample medium term plans provided by the National Strategy.

stakeholders.

There is, however, one obstacle that has been a constant throughout the life of the OMP. The uncertainty around funding has been a significant challenge throughout the life of the project, a challenge which would have stopped in its tracks many initiatives. This not only led to uncertainty around whether the project had enough funds to continue its work, but also some initiatives - such as rolling out the foundation stage workshops to seven schools - had to be put on hold. This has inevitably led to frustration. Faced with the very real prospect of having to close the project as NDC funding came to an end, the Project Manager set about establishing a board of directors and turning the formerly government funded project into an independent social enterprise. In the space of a few months the project manager has made astonishing progress. From a project on the verge of closure, there is now a highly experienced board of directors. At the time of writing 'charitable status' was in the process of being obtained.

5.3 School and teacher practice

The extent to which school and teacher practice has been changed by the project varies from school to school and from teacher to teacher. Through the observations and interviews it was clear that in several schools the OMP has served as a springboard for other initiatives involving parents and parent-child interactive learning opportunities. The attitude of teachers to working with parents also appears to have changed. While many teachers previously lacked the confidence to teach parents, OMP training has given them the confidence and skills to engage meaningfully with parents, viewing them as intellectual resources for their child's education rather than as a threat to their own teaching ability. With training from the OMP team, they have been able to *pass on* to parents the methods they are using in the classroom. This ability to *transfer* teaching methods used in the classroom to parents has been a significant success of the OMP.

While the primary and secondary frameworks for mathematics emphasise the need for mathematics teaching to be more interactive, game-based and involve more paired talk, the OMP gives teachers a concrete way in which to experiment with these new methods. Therefore, while it may not have specifically *changed* teachers' teaching practice, it has clearly enriched teaching practice and encouraged teachers to approach mathematics in a different way, not only in the OM workshops but also in their own mathematics classes and homework. In some schools, methods used in the OMP – for example more partner work - have also been transferred to other subjects.

5.4 'Lessons learned' and potential future developments

As the OMP goes into its new phase as a social enterprise, it aims to extend its reach to *all* schools across the UK, independent of the school's characteristics such as class, setting (rural or urban), ethnicity or economic status of pupils and parents. Indeed, while research has shown that children living in low-income working class families generally have lower achievement levels, research also demonstrates that parental involvement in children's education can be beneficial to all children, regardless of the above variants. Rather than the characteristics of the school, it is the factors identified under 'Contributory factors to OMP's success' (page 28) that will determine whether an OMP will be successful in a particular school or not.

SECTION 6: Voices of key stakeholders: parents, teachers and pupils

6.1 From the parents' perspective

Empowering parents to get involved in their child's mathematics education



Mother and daughter participating in an Ocean Mathematics workshop © OMP

Time and time again parents have related how the workshops helped them to bridge the gap between how they were taught mathematics at school and how their children are being taught mathematics today. This gulf can be especially evident where parents have been educated in different countries and contexts, as is the case with many of the Bangladeshi parents on the Ocean Estate. For many parents, gaining a better understanding of how their children are being taught mathematics in school is the first and crucial step to empowering them to play a more active role in their child's education. As two parents pointed out:

Maths has changed as well from when we were at school. It's totally different now to when I did my CSEs. It's a whole different curriculum, and to be able to understand what she is doing is really important. (mother of a year 8 child)

As well as showing them *how* the teaching methods and styles have changed, the workshops also give the parents an idea of the level of mathematics that is expected of their child. As explained by a primary school mathematics coordinator:

They are learning two things, not just especially about coordinates or area, but how we are learning maths at school; that we don't have to do sums like they did at school and also learning a bit about what is expected from the age group that they have come to the workshop about, so they are not at home trying to get the year 1 children to learn the 7-times table.

This ability of the OMP to *transfer* to the parents methods used to teach children mathematics is crucial in enabling parents to *understand* the way in which their children are being taught at school, thus empowering them to replicate the methodology at home.

Key to the Ocean Mathematics project is helping parents understand how they can play a fundamental role in their child's education and dismantling the perception that the education of their children only takes place in the classroom and only by teachers:

...they used to say to you all the time "that's your job" it's the teachers' job to teach the children. You do it better. They didn't value themselves as learners and being proactive in their child's education. Because they were doing it in Bengali or Sylheti and it wasn't in English and so therefore it had no value. Whereas we have actually shown them that it has a value. (primary school mathematics coordinator)

Ninety-eight percent of parents who answered the questionnaires felt that their contribution to their child's mathematics learning was either very important (70%) or quite important (28%). Likewise, 98% of parents considered helping their child with their homework very important (85%) and quite important (13%). Only seven parents didn't help their child with their homework (mathematics or other subjects). Interestingly, according to the results, parents helped their children in fairly equal proportions in mathematics (73%) and other subjects (76%). It is not possible to ascertain from these results whether the OMP had any impact in changing parents' attitudes towards helping their children in other subject areas. Comments by parents during the focus groups indicated that parents would often only help their child if they were struggling with an aspect of their homework. Numerous parents commented that prior to OMP they struggled in helping their children with their mathematics homework. For them, the workshops were invaluable in enabling them to familiarise themselves both with the type of mathematics their child was being taught in school and the teaching methods used by teachers. Indeed, as one primary teacher pointed out:

[H]omework isn't about doing hundreds and hundreds of worksheets and being locked away in a room with a tutor and actually its about getting them involved and that they really can have a very strong influence on the children's learning if they are fully involved.

Unlike some parents' experiences, as documented in the literature on this subject in which parents' 'outdated' mathematics methods are shunned, the OMP embraces all methods. Indeed this is seen as a source of richness. The key concept is that many methods can be used to obtain the same answer; it is the child's ability to think around the problem that is key. While the current national frameworks for primary and secondary mathematics mark a shift in this direction and a move away from rote learning, the OMP takes it one step further by encouraging a dialogue between parents as to how different methods can be used. Many parents who had previously lacked confidence in their ability to support their child with mathematics work now feel empowered:

And also the confidence of the parents, that has really grown. Parents are quite happy to say we do it differently. Yes that's okay and now we realise it is okay to show them in different ways and it is acceptable for children to know different ways, it's what way is more comfortable for the children. (primary school mathematics coordinator)

In addition, because the activities are game-based, parents do not find the workshops threatening and are more likely to understand the concepts and then be able to help their child. As one teacher pointed out:

Even if they have limited education they can help. Especially with these parents, where English is a second language, but if it is practical and game based then it's much easier. They [parents] didn't see it as a challenge... There weren't any additional responsibilities on them. They just have to drop in, be part of something and then go. It didn't threaten them in any way or form. It wasn't daunting. (primary school class teacher)

As well as reaffirming the value of parents' methods, the workshops and homework help to demystify the new methods in which their children are being taught. Parents develop an understanding that learning through making mathematics fun, playing paired games, through talking and explaining concepts to each other and through problem solving, is in fact one of the most effective ways in which a child can learn mathematics. The workshops and homework therefore breakdown preconceptions that "if you are having fun it's not work", "if you are not doing sums its not mathematics" and provide parents with a wealth of ideas of how to engage in mathematics activities outside of the school environment. In short, the OMP provides parents with ideas on how to make mathematical exploration an integral part of daily life:

[...] parents get ideas about how to sit down with their child to work together and knowing about maths and shapes and so many other things we didn't learn at school... You get so many new ideas, so many ways to talk about it...they really enjoy doing it. (interpreter during a focus group of parents)

As a result, parents feel much more confident in helping their child with mathematics. Indeed, according to the questionnaire results, 50% of parents feel that the Ocean Mathematics workshops and homework have changed the way they relate to mathematics in everyday life with their child. Not surprisingly this percentage was higher with parents in the primary school (66%) as generally speaking, the time children spend with their parents decreases as they get older.

Many parents related how scared of mathematics they were before the workshops and how helpless they felt in their ability to help their child. As a secondary school mathematics teacher related:

Another thing that is really good is that parents actually feel that they can actually support their child because what normally happens is when parents hear the word maths they completely freak out. By them coming in and slowly working their way into doing these maths puzzles and stuff, they realise that they can help them, it's not that they don't want to, they just don't know how.

Indeed, the results of the questionnaires clearly illustrate the transformation many parents experience as a result of the OMP. Eighty-eight percent of parents included in the questionnaires felt more involved in their child's education as a result of the OMP. Ninety-seven percent of parents either always (50%) or sometimes (47%) felt confident helping their child with their mathematics homework.

Following one mother's first workshop at George Green Secondary school she sent a letter to the school:

...As someone who passionately hates maths I really enjoyed the session and thought the time went really quickly [...] you made the time fun and really engaged all of us that attended. As well as enjoying the activities, I think that the relaxed and informal atmosphere had a lot to do with it as well. I am truly hopeless at maths, but was never made to feel so, just encouraged to think and to just have a go.

These reflections clearly demonstrate the success of the OMP in giving parents the tools – in a non-threatening and informal way - they need to meaningfully engage with their children in their mathematics learning. Demystifying mathematics and showing parents how they can incorporate mathematical exploration into their daily lives with their children has transformed the level of parents' engagement in their child's education.

Improving the relationship with the school

Several schools commented on how the perception of the workshops by parents has changed dramatically during the life of the project. The experience in one primary school is emblematic of this transformation:

Invariably they used to have appointments always on the day that the workshop was running. Because it was just a fear factor [...] Whereas now the difference is they come and they don't like to leave before [its finished] [...] They see the value of it. They can play the games easily. They become more confident. They actually love coming. They'll come up to me...my children are doing fractions, I'm not very good, can you do some extra workshop, just for us? ..A few years ago they would not have even dreamed of doing anything like that. That's something else, they now, they are quite happy to say "I don't know this" "Can you help?" (primary school mathematics coordinator)

From parents viewing the workshops as an unwelcome obligation at the beginning, it has become an expectation; part of the school's activities. As one primary school mathematics coordinator commented, *"At first it [the workshop] was purely getting the parents in and now we've got the parents banging the door down to come in"*. Likewise, in another primary school, the workshops have become so much part of school life that two years ago the OMP outreach workers stopped calling parents prior to the workshop to remind them to attend the workshop as it was no longer necessary:

What we've done is set up the expectation. It's not needed now. If we said we were stopping the workshops they would be up in arms. They would be saying "What do you mean? This is one of the times that we get to come in and find out something about what our children are doing in school". (primary school deputy head)

The fact that Ocean Mathematics provides highly experienced Bengali – and specifically the Sylheti dialect that many of the parents speak on the Ocean Estate – interpreters also contributes to making the workshops accessible to all. Indeed, as seen in the literature review, language is often referred to as a major barrier when discussing the involvement of parents in the school life of their children. Providing this space for parents to engage with their children in their own language can be a liberating experience for a parent whose mother tongue is not English, particularly in the case of mothers whose English tends to be more basic than fathers, who are often the ones who go out to work:

...mothers of this community are very shy, they come with the hijabs, with the baby [...], they are not in a comfortable position, but after 10-15 minutes, the way we create the atmosphere of the class, they start getting involved, they even speak out, they come to the front and solve the problems with their son or daughter on the whiteboard. So it's a big achievement, from a shy mother who doesn't want to speak [...] she is giving verbal feedback, speaking in her own language, putting all her shyness away, speaking out. (Ocean Mathematics interpreter)

Critically, the workshops have also increased parents' confidence with staff, with parents feeling more confident approaching the school and voicing their own needs. Many parents

have actively participated in the yearly OMP conference and, in several schools, the number of activities for parents has increased since the OMP started. Indeed, 48% of parents who answered the questionnaire stated that the OMP had improved their level of involvement with the school.

The workshops appear to have been so successful in empowering parents to support their children in their mathematics education that many parents (and children) have requested workshops in other subjects, namely science and English. As one parent suggested:

I think we should have it for other subjects. If Ocean has been a success, which I think it has, you should do it for other subjects...If Lucy brings science home, I haven't got a clue and that's where I feel like I'm letting her down. I'd like to be able to sit down and say okay Lucy this is why this happens. She asks me so many questions and I just look at her and think 'I can't answer you'.

Improving parent-child relationships



Father and son working jointly on a mathematics activity during an OMP workshop © OMP

The Ocean Mathematics workshops and homework not only provide parents with the framework in which to get involved in their child's mathematics learning, they also give children the opportunity to talk to their parents about what they are doing. In many cases this space has led to improved communication between parent and child. Many parents related how much they enjoyed and valued the time spent with their child both at the workshop and when doing the Ocean Mathematics homework together at home. As one mother of a year six child commented, '*It's the communication throughout the game you do with your kids, its lovely; it's a really good experience*'. In secondary schools, where children are more independent, this is especially the case. As one secondary (year 8) school father commented:

It helps them [the children] see the point. I think being involved, gives them a framework to talk to their parents about what they are doing. It's actually quite hard for kids to start talking to their parents about what they are doing when a parent has come into it cold. They don't know how much to explain, the parents don't know how involved to get, how far to go. So I think having a structured way for that interaction is really helpful... I find he is more willing to talk about maths because you've got the joint homework. A lot of other things he's reluctant to talk about.

Some parents also commented that their child's behaviour improves as a result of the workshops and, in particular, around the time of the workshops, as the children are aware that through the workshops their parents now have direct contact with the school.

Parents own learning

In answer to whether parents would like to see more workshops in other subjects, one mother answered, "Yes, *if only to teach me!*" Indeed, while initially not a specific aim of the OMP, through the workshops and interactive homework parents throughout Tower Hamlets have been improving their own understanding of mathematics. This has clearly been one of the OMP's ripple effects. Unlike other government initiatives to improve parents' skills where trained practitioners teach courses, in the OMP it is often the children themselves who explain concepts to their parents. As one mother's experience illustrates: *I've learned lots of words I've never heard of before, denominator, numerator. Last night Lucy sat through fractions with me. I'm hopeless with maths so I've learned an awful lot really.*

This innovative approach not only empowers the child but also represents a non-threatening environment in which the parent and child are both learning together on an equal level.

6.2 From the children's perspective

As part of this review we carried out focus groups with pupils (with approximately four to six children per group) slightly altering the questions depending on the ages of the children. It is important to bear in mind that while both primary and secondary students receive five Ocean Mathematics homeworks a term, pupils in secondary schools only attend one Ocean Mathematics workshop a year, whereas primary school pupils attend one each term.

Learning through making mathematics fun

The results of the questionnaires confirmed the results of the focus groups where all children interviewed said that the Ocean Mathematics workshops and homework had increased both their enjoyment and understanding of mathematics.

The questionnaires revealed a marked difference, however, between the way in which primary and secondary pupils experienced both the Ocean Mathematics workshops and homework, with primary school pupils expressing more positive views than secondary school pupils. For example, according to the results, 88% of primary school pupils said they enjoyed (54%) or sometimes enjoyed (34%) the Ocean Mathematics workshops and homework, whereas in secondary schools the figures were 26% and 44% respectively (a total of 70%). In other words, more than twice the number of primary school pupils said they enjoyed the workshops and homework.

Similarly, in terms of whether the OMP had made mathematics easier for them, 60% of primary school pupils said yes, compared to 34% of secondary school pupils. Nearly double the proportion (23% compared to 12%) of secondary pupils thought that the OMP hadn't made mathematics easier for them.

Some comments from pupils

"I want more homework because I am learning more things in maths" (year 7 pupil)

"I like Ocean Maths because all the family members of all the students can contribute and learn how to do maths" (year 7 pupil)

"It is very enjoyable and fun. It's nice to learn and have fun at the same time" (year 9 pupil)

The differences in the popularity of the OMP between primary and secondary pupils are likely due to several factors related to the different stages of children's development. Such factors could include pupils' embarrassment of being seen with their parents; conflictive parent-child relationships as children seek to push

boundaries and seek independence, and peer pressure to be 'anti all things school related'.

In answer to what pupils liked best about the Ocean Mathematics workshops and homework, primary school pupils ranked the prizes on top (43%) followed by the games used in the workshops (32%), whereas for secondary school pupils the games were the most important (45% compared to 17% for prizes). While strictly speaking meant for the adults, the prizes have proved a very useful tool for the project, both providing parents with simple resources for their child's mathematics learning at home (such as dominoes or a geometry set), and also as an incentive for the parents to come to the workshops. Indeed, several parents related how their child repeatedly reminded them to attend the workshop so they could get the prize.

The popularity of the games in the questionnaire results echoed the comments made by pupils during the focus groups. Learning through making mathematics fun and the use of games and puzzles, according to pupils, made it "*easier to get the concepts*" and "*at the same time as learning we are having fun as well*". Indeed, as one year six pupil said:

When you are in class and the teacher just talks and talks and saying do this and do that and you don't actually get any help, but with Ocean Maths they give you examples, they help you. And it's laid out so you understand it and they give you examples. They give it in another language so the parents understand it.

Crucial to engaging the children therefore has been the ability of the OMP and, since the schools have taken it over, the teachers, to devise creative and interactive games which engage children in the learning process.

Improving pupils' relationships with their parents

In the focus groups, all students said they liked having their parents at the workshops, although one year 8 pupil acknowledged that some of her fellow pupils were embarrassed about their parents coming. Indeed this same pupil refused to go up to the front of the class with her mother during the Ocean Mathematics workshop. OMP outreach workers also said that it is quite common, particularly in secondary schools, that children try to prevent their parents attending the workshop, embarrassed to be seen with their parents. This is where the work of the outreach workers is crucial, as, particularly in secondary schools, the children are often parents' only link with the school. Letters sent home with pupils informing parents of a workshop can get lost, and in some cases pupils have sought to down-play the importance of their attendance. As one year 7 mother commented, "*Sometimes the children when the letter comes home they say it's not important, you don't need to attend. So when you get the phone call you know it is important*".

Several students also mentioned the fact that the workshops help their relationship with their parents. They welcome the fact that their parents can see what they are learning and how they are doing in mathematics. In addition, as mentioned previously, the workshops and the paired game in the homework provide an ideal framework for children to engage with their parents in an area that, in normal circumstances, an array of barriers would prevent them from doing so.

In terms of the homework, the majority of both primary (55%) and secondary (33%) school pupils did their Ocean Mathematics homework with their mothers. After mothers, in primary schools, fathers were most involved (27%) followed by sisters (24%), brothers (19%) and 'others' (17%). 'Others' could include carers or other family members such as uncles, aunts or grandparents. With secondary school pupils, after mothers, brothers were most involved (17%), sisters (15%), fathers (14%) and 'others' (40%). It is interesting to note that in the case of secondary school children, a significant proportion played the interactive game with people other than their closest family members, suggesting that a predominant part of their homework support may come from carers or tutors.



Mother and son playing a mathematics game together during an Ocean Mathematics workshop © OMP

According to the questionnaire results primary school pupils are more likely to get help in subjects other than mathematics from their parents/family members than in secondary schools. In primary schools 39% of pupils said their parents help them (and 39% said they 'sometimes' help them) whereas in secondary schools only 15% of pupils had help from their parent/family member in other subjects (35% sometimes had help). These dynamics therefore mirror the general trend whereby parental involvement in their child's home learning generally decreases as children get older and parents have less contact with the school.

6.3 From the teachers' perspective

Engaging children in mathematics learning



Mathematics teacher at Stepney Green Maths and Computing College delivering an Ocean Mathematics workshop. © OMP

The game-based interactive teaching techniques and variety of styles of activities (visual, mental and practical) employed in the OMP could not be more removed from traditional rote learning methods in which pupils are explained a particular concept and then instructed to do pages of sums. Many teachers have found that the interactive nature of the workshops and homework enables children to actually *understand* both the concept and different processes which can be employed to obtain a particular answer. Indeed, as one primary teacher said, *'Often it's not how difficult the work is but how motivated they are. If they are motivated, they can do the work.'* The lack of interaction in traditional mathematics teaching methods is encapsulated by the comments of one secondary school mathematics teacher:

Sometimes in normal lessons you get total silence, kids working on their own. They are not understanding the concept, or the theory or the method. They are just trying to understand the correct answer and that's all they are trying to agree on. That's it, and then they are moving on.

All of the teachers interviewed believed that the Ocean Mathematics workshops and homework had improved pupils' level of understanding of mathematics. Sixty-seven percent of teachers that answered the questionnaire agreed that the workshops and homework had improved pupils' understanding of mathematics, while 33% said that it was 'difficult to say'. The workshops and homework do not introduce any new mathematical concepts, but rather reinforce what the children have already been taught. Ensuring that children understand these basic skills is crucial for pupils' subsequent ability to understand more complicated mathematical concepts. As one mathematics coordinator pointed out:

The teachers feel also [...] that the homeworks are a way in for children in a fun way to get to know those basic necessary skills they need for each one of those topics. And they have also said that whatever those homeworks focus on for each of the topics those are the things that children need to be confident with... So while at the beginning they were "oh I don't want to give up my homework", now they will gladly do [so] and they feel it has really helped to raise children's understanding of the things they need to be confident in in order to do those more complicated things, so that's been positive.

In addition, because the pupils enjoy doing the activities, the incidence of copying is much lower as they don't want to be missing out on all the fun:

...[W]ith Ocean Maths they're not bothered to copy as they want to be part of the fun so what's the point of seeing everyone else have fun. I've got to play it myself to be part of the fun. So the element of copying or cheating just isn't there. (primary school class teacher)

The above comments illustrate clearly how the OMP can facilitate the work of teachers both by providing well-designed homework and by providing teachers with the tools to explore ways of engaging their pupils in a more interactive mathematics learning process.

Teachers' professional development

Through delivering the workshops, receiving high quality training and dedicating time to select or create appropriate activities for workshops, the introduction of the OMP in both primary and secondary schools has also contributed to teachers' own professional development. It has resulted in increased confidence, in particular in regard to their mathematical knowledge and to teaching parents, improved attitudinal changes towards the teaching of mathematics and an enrichment of their teaching practice, to name a few.

The interviews with teachers made clear, however, that parental involvement initiatives cannot rest on the assumption that school staff feel comfortable or confident in working with parents. Indeed most teachers interviewed recognised that the skills needed to deliver workshops to parents and children differed to those required in the classroom. Most teachers admitted to feeling apprehensive when they were first asked to deliver the workshops and effectively move out of the 'comfort zone' of normal classroom dynamics. Indeed, conducting lessons in front of parents is not something common within schools. As one newly qualified secondary mathematics teacher recounted:

When it first started off I was so weary, it was my first year here as a NQT, I really didn't want to do it. Delivering a lesson to parents, I thought I could just about do it for children, you know I'm still learning, but parents, I thought I can't do this! It really really stressed me out. But then I did it and it was okay. But as the years went on it's so much easier and I can do them and it's not a problem at all and I really enjoy it. I love it now.

Another primary head teacher also related how the OMP not only helped improve her teachers' confidence to teach in front of parents, but also improved their subject knowledge:

One thing it has really done is to develop the teachers' confidence. Lots of the teachers are very good classroom practitioners but wouldn't have wanted to have stood up in front of the parents and done it. [...]. It's also helped some of them in their teaching as well, where there have been teachers who have been less confident in their subject knowledge. It's been very supportive to work alongside other people and not just people in school but also [...] from Ocean Maths.

It is important to point out, however, that while teachers have ultimately welcomed the opportunity to deliver the workshops, all teachers recognised the importance of having the OMP staff deliver the workshops initially. We believe this is crucial. Firstly, it ensures that teachers have received sufficient training before embarking on delivering a workshop. Secondly it gives teachers the opportunity to observe workshops delivered by expert OMP staff. Lastly, it can help in raising the profile of the project, which in turn will make parents more likely to attend. Thorough training, observation of workshops and a gradual participation in the delivery of the workshops will ensure that the high quality of the workshops is maintained and the teachers feel comfortable in their new role. For original schools the OMP led the workshops for several years whereas in schools that have recently introduced the OMP the transition has happened much earlier, with teachers taking over the delivering after four workshops.



Primary school mathematics coordinator during an Ocean Mathematics workshop © OMP

All teachers interviewed enjoyed delivering the workshops and the stimulus they experienced through experimenting with new approaches. They attributed much of their confidence to the way in which they have been supported by the OMP. This includes the high quality training from the Ocean Mathematics team, the gradual hand-over of the delivery of the project from the OMP team to school staff, as well as an array of other support in the form of dialogue about which activities are suitable for workshops, monitoring of the homework and flexibility of the project team to adapt the project to the needs of the specific school.

Changes in teaching practice

While there is a general policy shift towards game-based interactive teaching and emphasis on developing conceptual understanding and reasoning over rote learning and memorisation, the OMP gives teachers a concrete forum in which to explore these relatively new methods. This has led to new dynamics in the mathematics classroom. As one secondary school head of mathematics commented, this interactive method is something new:

I can never remember going into a maths lesson and seeing a teacher doing group work and paired activities. It was all about them standing and teaching and giving them the books to do the exercise. But now it's not like that. Now they have whiteboards, "show me your answer", "talk about it".

Some primary school teachers felt that the teaching methods used in the workshops were very similar to the approach advocated in the Primary Numeracy Strategy (game-based, paired talk, problem solving etc.). The extent to which teachers have incorporated the methods, styles and types of activities used in the Ocean Mathematics workshops and homework into their own teaching methods varies from teacher to teacher. From the interviews carried out as part of this review, it appeared that generally the newer teachers – in particular NQTs – experienced a greater impact on teaching practice. Most teachers interviewed felt that the OMP had enriched their teaching, with teachers commenting that it had taken away the amount of homework that is mass produced, reminded them that mathematical concepts can be linked to practical examples or experiences and of the importance of children working in pairs and talking to each other about their mathematics, and of making mathematics exciting. The results of the questionnaire confirm this, with the vast majority of teachers (91%) saying that both the delivery methods used in the workshops and the style of Ocean Mathematics homework has influenced their mathematics teaching practice. As one secondary school mathematics teacher remarked:

Yeah, it definitely has impacted me. I have never had the opportunity of seeing the kids in that environment where it is all activity based, so its definitely allowed me to take that on board and experiment as a teacher.

Several teachers related how they had incorporated similar methods into their own mathematics classes, for example by doing an Ocean Mathematics style starter at the beginning of a class or by doing an Ocean Mathematics style activity as a treat. As one secondary school mathematics teacher said, "After Ocean Maths they say, oh miss can we do more of that, they just want the whole lesson to be puzzles and games! I think they don't realise that they are learning at the same time which is really good!"

Some teachers in primary schools also thought that other subject areas had been impacted, most notably science. Indeed, one primary school has actively tried to transfer the skills gained through the OMP into all of their curriculum teaching. As the mathematics coordinator explained:

We saw what a success the project was. We have tried to transfer those skills into all of our curriculum teaching, doing a lot more partner work, cooperative work and mixed ability work and actually thinking about how powerful it is to teach someone else a skill because that's the best way you learn is by teaching someone else, we've really tried to drum that across the curriculum as well.

Gaining new ideas about teaching methods has also included, for example, introducing a concept through a historical perspective, as is done at the beginning of the year 8 and 9 Ocean Mathematics homework sheets, something which, according to one mathematics teacher, is rarely done in schools today.

Improving the learning circle: parents – teachers – children

[F]rom the teachers point of view its perfect in that you get to see the parents in a type of situation other than a parents meeting, which is often more formal, individual and intimidating for parents. In a maths workshop you are going around, playing a game. Parents might have a quick question, you could have a quick question, you know, are they all-right?... Teachers can make the most of that. (OMP trainer)

From the interviews and questionnaires with teachers it was clear that the workshops had greatly improved their own professional relationship with their pupils' parents. Sixty-seven percent of teachers said the workshops had improved their relationship with parents (33% said it had stayed the same). They have helped teachers to bridge the gap between home and school:

The biggest impact is that they now believe that its not just teachers teaching their children, that we can all work together; children can teach parents but parents can teach children as well as teachers. So it's like a 3-way thing. (mathematics coordinator)

Other teachers talked of the trust that this contact built between them and the parents; another teacher talked of an "imaginary bond" not only between the teacher and the pupils, but also between the teacher and the parent, and the pupil and the parent. For him Ocean Mathematics' role in building this bond was extremely important:

...How many times do we see that bond? We don't really see that bond often enough in different subjects. That is a bridge that was always broken for a lot of the time even when I was doing my PGCE and that's a bridge that Ocean Maths is actually amending. (secondary school mathematics teacher)

According to some teachers, because the parents are more engaged with the school, pupils are more focussed in their work.

Support and flexibility from the OMP team

The nature of the support from the OMP team has been crucial to the success of the project in each and every school. Time and time again teachers have commented on the invaluable support they have received from the Ocean Mathematics Project team: the excellent training on how to deliver the workshops; the outreach support in encouraging parents to attend workshops; making available an interpreter and crèche worker, and perhaps above all, the willingness of the project team to respond to the individual needs of the school, parents and pupils.

It was extremely important for teachers that the project was not simply "plonked" on them. Teachers' comments bear testament to the fact that, rather than simply delivering a project, central to the OMP has been a constant effort to include *all* key stakeholders in the evolution of the Ocean Mathematics Project. As the Project Manager said, "*This project is what it is today because of the key stakeholders. They are the ones that have made it work*". Indeed it was one of the project's key stakeholders – the then mathematics coordinator at Ben Jonson Primary School – who instigated one of the most significant changes to the projects – that of holding joint parent and child mathematics workshops, something that had never been done before.



OMP Consultant (middle) delivering a workshop. Parents, as well as children are encouraged to participate in the interactive mathematics games. © OMP

This constant dialogue between the OMP and the schools has ensured that the project has become an integral part of the school:

...the one thing that's been really really good is that Ocean Maths didn't want to have a project that was plonked in the school... I think that the reason why it works is because you make it your own, you don't have to run it in any certain way. You can make sure its part of the school day, its not bolted on; it's included in all aspects of school life. It's got the flexibility to be done that way. There is no rigidity. It's so so flexible. (primary school mathematics coordinator)

Enormous credit needs to be given not only to the Ocean Mathematics team in general, but also to the Project Manager, Pinder Singh, for making the project what it is today. Her strength of personality, people skills, focus, dedication, commitment and single-mindedness in pursuing things on behalf of the schools has been mentioned time and time again by school staff. As one deputy head from one of the original primary schools sums up:

The key factor in the success is Pinder. In terms of her single-mindedness in pursuing things on behalf of the schools and really listening to what schools were telling her and what they were learning from the experience, and asking us what would our response be and how would we go about that. She is obviously a very clear thinker and very determined, and cuts through things very very quickly, she doesn't suffer fools. She is quite formidable when she wants to be. She's so fantastic at saying thank you to people and well done.

The fact that the OMP has listened to and taken on board concerns of staff has also been crucial for its success, for example, in the early days when teachers were dissatisfied with the homework. Without this openness it is unlikely that the project would be taken up to the extent it has been by teachers. As one primary school head teacher remarked:

Keeping the consultation going initially with the staff. I think if we hadn't and Ocean Maths hadn't taken on board our comments it would have fallen flat. But where things weren't working it was fed back and acted upon, so people felt valued and that their opinion mattered.

6.4 From the school's perspective

Integration of the OMP into school practice

Interviews with school staff members indicated that in schools where the OMP has been running for several years, the Ocean Mathematics workshops and homework have become fully integrated into the life and culture of the school. Indeed, as discussed below, in some schools, practices developed as part of the OMP have not only become embedded within the teaching of mathematics, but have also spread to other subject areas.

This has been made possible due to the fact that the project is closely linked to the mathematics curriculum and the National Numeracy Strategies. Indeed, the key objective on each Ocean Mathematics secondary school homework is directly linked to the sample medium term plans provided by the National Strategy. While, at the beginning of the project, concerns were raised by teachers about the homework not fitting in with what teachers were teaching in the classroom, these issues have clearly been addressed.¹⁴ Furthermore the way in which the issue was addressed has served to strengthen the sense of ownership teachers have of the project and bears further testament to the project's constant insistence on responding to the needs of its stakeholders.

Receiving the Ocean Mathematics homework at the beginning of the term is crucial and enables teachers to fully integrate the homework into the planning cycle. The extent to which the project is integrated into the school culture will impact the extent to which the projects are successfully sustained after funding runs out. All six schools that started the project between 2001 and 2005 were fully committed to continuing the workshops and homework in their schools and acknowledged that they would have to take over certain roles the OMP team had undertaken up till now, principally outreach work with parents, homework monitoring and, in primary schools, devising their own plans for the delivery of the workshops. While during the past three years the OMP team has been very successful in handing over the planning and delivery of the workshops to the schools themselves, efforts to handover the outreach work and homework monitoring appear not to have been a priority.

¹⁴ In response to feedback from teachers the OMP organised a forum in which the views of the teachers were taken on board. The homework was redesigned and has since been fully integrated into the National Numeracy Strategies.

As a spring-board for other parental involvement initiatives

The majority of schools included in this study were already engaged in efforts to involve parents in their children's education when they started the OMP. However, in numerous schools, such as Cayley Primary School (see box), the success of the OMP has acted as a 'spring-board' for other initiatives aimed at increasing the involvement of parents in their child's education as well as initiatives which responded to the needs of the parents themselves.

Cayley Primary School

Since setting up the OMP project five years ago, Cayley Primary School has established a weekly *Parents Voice* session where the staff room is opened up to parents and, together with a learning mentor, they discuss any issues of concern, which are then fed back to management. They also have weekly homework clubs for children who rarely hand in their homework, which parents also attend. Following parents' suggestions, they have also set up a variety of workshops for parents only, ranging from mathematics, phonics, art and literacy. On an average week they now have three to four workshops. They have also had six-week certificated courses such as parenting skills and drugs awareness. To try and incorporate the philosophy behind the Ocean Mathematics homework to other subject areas, they are also putting together a booklet with ideas for parents on activities they can do with their children outside of the school environment; activities which will help the child's learning in all subject areas. They have recently also extended the OMP to the foundation stage.

As the OMP has grown with the needs of its key stakeholders, the parents have shaped the schools activities to involve parents. As Cayley Primary School mathematics coordinator points out:

It's also had a knock on effect; the parents asked for a workshop, purely for them, on maths at their level so they could understand the progression in maths... I did a pure parents workshop and I went through our calculations policy and showed them how we

teach addition and subtraction. And they shared their ways, like counting with the lines on their fingers and things like that. We just really valued that and we said 'You share that with your child and they can explain to you'. So that was really lovely. And they want more of those, separate mothers and dads ones for cultural reasons. So we are hoping to do that next term as a series of mini workshops just for the parents.

In schools such as Cayley the OMP has clearly been the major contributing factor to changing the *culture* of the school to one where parental involvement is central to school life. Some schools run booster workshops for borderline GCSE students or small groups of children and their parents. Others run workshops for a small number of parents who are struggling with helping their children with mathematics.

In many schools therefore, the OMP has provided a structured framework from which schools have extended their engagement with parents in their child's learning process, not only in mathematics but across the whole curriculum. The expectation of the parents to be involved in their child's mathematics education has greatly facilitated schools' efforts to engage parents in other areas of the curriculum. The openness and willingness of the OMP team to help schools cater to the specific needs of their students is also key in enabling schools to maximise the effectiveness of the OMP in line with the realities of each individual school.

Improving attainment

While some schools have not witnessed improvements in attainment, others have seen a significant rise in standards since introducing the OMP. These improvements can perhaps be best illustrated by two of the original schools, Cayley Primary School and Stepney Green

Secondary School. When the OMP was started in Stepney Green, the school was in special measures and, according to a 2001 OFSTED report, Cayley had 'serious weaknesses'. While parental involvement was low at Cayley, it was non-existent at Stepney Green. The latest OFSTED reports have praised both schools in their efforts to involve their parents in their child's education and acknowledged significant improvements in their standards in mathematics. At Stepney Green, since introducing the OMP in 2001, nearly 20% more KS3 pupils have achieved level 5 or above (from 50% in 2002 to 69% in 2007, above the average for Tower Hamlets). From being in 'special measures' it is now a Maths and Computing Specialist College.

For Cayley its 1998/9 KS2 SAT results were 30% level 4, one of the poorest in the borough. In 2007 this had risen to 92%. From no children obtaining level 5 in KS2 in 2001, in 2007 49% obtained level 5, well above the national average. While OMP can by no means claim all the credit, as the school's mathematics coordinator explains:

Its not purely down to Ocean Maths, there have been lots of other initiatives, but I think that's been a really good spring-board in terms of enjoyment of maths as well and seeing maths as more than just a worksheet of sums. It did take us a while for the parents to understand that playing games are just as beneficial as writing 20 sums down. It's really made people's thinking . . . progress.

Despite the reluctance of all participants to link improved achievement to one single project, Ocean Mathematics has developed a strategy which could, if rolled out across UK schools, drastically alter levels of achievement in mathematics across all key stages.

Improving homework hand-in-rate and quality

The vast majority of teachers interviewed as part of this review reported not only better hand-in-rates for the Ocean Mathematics homework but also improved homework quality. Improvements have often been quick to occur, with one primary school which started using the homework in November 2007 already witnessing significant improvements: "*The first 2 [Ocean Mathematics] homework that we sent home [for] year 2, we received about 30-35% and they are now on average of 70 – 80%*" (mathematics coordinator).

Many teachers say that this improvement can be attributed to the style of the homework (glossy, coloured homework sheets which pupils are less likely to lose), the types of exercises (i.e. more game-based) and the fact that central to each homework is a game to be played with their learning partner at home.

Teachers commented, however, that homework returns tends to change from week to week and often depends on how much emphasis is placed on the importance of the homework by individual teachers.

SECTION 7

7.1 Suggestions for maximising the effectiveness of workshops

Through carrying out interviews with a selection of key stakeholders and observing six workshops¹⁵ the following suggestions for improvement can be made. It is hoped that these will assist both schools and the OMP team to maximise the effectiveness of the Ocean Mathematics workshops.

Suggestion	Explanation
More effort could be made to engage parents as active learners and not just agents for their child's learning	<p>In several of the workshops parents were not actively encouraged to participate in the workshops. As the OMP Project Manager explained, "<i>passive participation is no participation</i>". Engaging parents as active learners includes encouraging parents to participate through answering questions in the workshop, and coming up to the front of the class with their children to explain how they obtained an answer or to demonstrate how to play a game. It is necessary to create a relaxed and non-threatening atmosphere in order to be able to do this. The aim of the workshops should be to engage <u>both</u> the children and their parents. Depending on the confidence of the parents, the OMP and the schools could also consider engaging parents in the actual delivery of the workshops,¹⁶ thus giving parents themselves more ownership of the workshops and making a greater recognition of the contribution parents can make, not only to their own children, but other children too. There were some cases where working parents had requested evening or weekend sessions. Where possible these requests should be addressed.</p> <p>In one workshop an extension had been prepared for the parents to try at home. This was a good way of helping the parents with their own mathematics learning.</p>
High quality interpretation	<p>This should always be provided where necessary. This should include translations of all information, and not just introductions to activities. It is crucial that the interpreter fully understands the mathematical concepts and is able to interpret them effectively. Where languages other than Bengali (or Sylheti) are needed, effort should be made to have interpreters that can sit by parents who need translation.</p>

¹⁵ The observations of each workshop are found in Appendix II.

¹⁶ One primary school class teacher said, "*We should have asked parents to come up to the front of the class and ask them to lead one of the sessions or be part of a session. . . That would have really got them involved, engaged, and ownership would come into it as well. We all feel good if we have ownership over something. And that would be talked about ...obviously there would be the fear factor if they messed it up. There are educated parents that we could have asked, that speak Bengali and English ...they wouldn't have to do a full session, just five minutes or something, read out numbers and simple things.*" For an example of a parental involvement project where parents are trained to participate in the delivery of workshops as equals to teachers see Civil et al (2005a).

Respect parents' time	While most schools were very good at starting on time, parents in one school had to wait 25 minutes before they were let into the classroom. Several of the parents were taking time off work. Respect should be shown and no time wasted. Alternatively, if this is unavoidable, a space should be provided where parents can help themselves to tea or coffee while they wait and speak to one another, thus benefiting parent-parent relations.
Ensure the 'inter-activeness' of the workshops	In the best practice examples, during the workshops children were first encouraged to explain how they obtained an answer or how best to approach a problem to their partner, <i>before</i> someone was called upon to share their answer with the class.
Have extensions up your sleeve	In order to cater for classes with mixed abilities, and indeed for different abilities within set classes, it is important that teachers think of ways of adapting the activities to cater to students' differing abilities. For example, some pupils will finish workshop activities sooner than others. Teachers should both have extensions of activities to make an activity harder, as well as simpler alternatives for students who may struggle. Teachers themselves will know best which classes require such adaptation. Ideas on how parents can 'extend' activities contained in the homework are also very useful for parents.

SECTION 8: Transferability of the Ocean Mathematics Project

8.1 From an NDC funded project to charitable status

Since it was known that funding was coming to an end, the Project Manager has done an incredible job of putting all the necessary requirements in place to enable her to transform the project into an independent charity. Within months an extremely experienced Board of Directors was set up and at the time of writing this review the organisation had been 'incorporated' and they were in the process of gaining charitable status. The next crucial step will be to obtain funds to secure the financial stability of the project.

8.2 Handing-over phase

Since the beginning of the third phase of the NDC funding (2005 – 2008), the Ocean Mathematics Project team has been working with schools to hand-over the delivery of the workshops. All original schools now deliver the workshops themselves and from the selection of schools included in this review, this appears to be running smoothly. With schools that have started implementing the OMP since 2005, the strategy has been to start the hand-over right from the beginning. For the ten schools that began the project since September 2007, this transition has been incorporated from the very beginning, with the Ocean Mathematics team delivering the first workshop, the second and third delivered jointly with the mathematics coordinator and the fourth workshop led by the mathematics coordinator and supported by the OMP team. The idea is that in subsequent workshops teachers gradually take over the delivery of those workshops.

However, while all schools have either taken over the delivery of the workshops or are in the process of doing so, to date OMP has continued in its supportive role – providing interpreters where needed; providing outreach support; monitoring homework etc. As of April 2008, however, schools have been faced with a choice: either pay for Ocean Mathematics' continued services or take them over themselves.

8.3 Ocean Mathematics website

The Ocean Mathematics website (www.ocean-maths.org.uk) was launched at the 2007 Ocean Mathematics Conference. The website contains a wealth of practical information regarding how to set up an OMP in a school: how to organise, promote, deliver and follow up the workshops as well as down-loadable homework and an array of video clips. While it serves as an excellent source of information, it was clearly designed with a view to providing schools with the necessary tools to take the workshops and homework forward *without* necessarily receiving input from the OMP team. This is understandable given the context that NDC funding was set to run out. This means, however, that as the website currently stands schools can download everything they need to implement the OMP in their school. This could have implications in OMP's ability to safeguard the quality of the OMP in schools across the country.

8.4 New schools

Any school that is interested in implementing the OMP is first invited to observe a workshop in one of the schools where it is already being implemented. As of April 2008 such schools will be offered one of three packages: light, standard and maximum. The *light* support package is designed for clusters of schools and involves OMP staff delivering two workshops in one of the cluster schools to which all of the schools' mathematics coordinators or heads of mathematics will attend; training meetings with mathematics

coordinators/heads of mathematics in the planning and delivery of the workshops, as well as how to introduce the Ocean Mathematics homework during normal class sessions, and how to effectively monitor the Ocean Mathematics homework. The mathematics coordinator will then be responsible for taking the lead on the workshops and homework in their schools, and training up class teachers.

The *standard* model is identical to the light model but takes place in one school only and is therefore more expensive. The *maximum* model will provide training for each teacher who will be involved in the delivery of the workshops, and OMP will run workshops for each year group.

8.5 Potential future challenges

Quality assurance

This review has clearly demonstrated that the input from the OMP team is crucial in giving schools the necessary tools to ensure that the quality of the workshops is safeguarded, and ultimately whether the project succeeds or not. The importance of OMP staff delivering the workshops during an initial period with a gradual hand-over to fully trained teachers has also been underlined. With the end of the NDC funding and Ocean Mathematics functioning as a non-profit making charity as of May 2008 schools will have to pay for OMP's services. How will this impact the effectiveness of the OMP? What framework will be put in place to ensure that the quality of the OMP is not compromised?

According to the Project Manager *"In the training we provide, we will make absolutely certain that we build [the issue of quality] into our training programme...So the systems that we put in place in every school should consist of these standards."* However, she also recognises that after the training programme ends, it will be difficult for the OMP to monitor the effectiveness of the projects in each school, especially if the school is not paying for this service.

The models described above provide the framework through which schools can receive the training they need to be able to implement the project successfully. Allowing schools to implement the project without the project team's input, we believe, would jeopardise the effectiveness of the project and ultimately its reputation.

With the above in mind we make the following recommendations:

- The packages should include at least one observation of a workshop by the OMP team and an ongoing programme of refresher trainings whereby OMP can give feedback and teachers can discuss any issues or difficulties they may be experiencing. This could take place between six months and one year after the first workshop has taken place.
- Where there are clusters of schools implementing the project, one mathematics coordinator or head of mathematics should be identified by cluster schools' senior management who will be the main contact person with the OMP team. They would receive additional training to enable them to support the other schools within their cluster and ensure that certain standards are being met, and workshops are being delivered in accordance with OMP guidelines; that effective outreach work is being carried out, that interpretation is of high quality and that homework is being sufficiently monitored. It would also be important that they are given sufficient time to carry out their role effectively. Cluster schools may choose to rotate this role.
- A long-term goal could be to recruit additional members of staff in regions where a significant number of clusters exist. This would relieve the strain on the team in London and facilitate logistics of monitoring project implementation in each school.

- It should be made clear to schools that the project is a long-term project and requires full support of senior management. This should include full commitment to set up a staffing structure to support the successful implementation of the project.
- Update the website to reflect the new framework for working with schools and safeguard the high quality of the workshops. Make clear on the website that schools can only implement the OMP by first participating in one of the three packages. This needs to be non-negotiable. Otherwise the hard-earned reputation of the OMP will be at stake. Certain parts of the website such as the downloadable homework should only be accessed with a password which all participating schools are given once they have gone through the initial stages of training. The website could also potentially be developed to include an internet forum in which participating schools could share good practice or raise particular issues for discussion.

Sustainability

In addition to the recommendations included in this review, it will be important that the project not only continuously mirrors changes in the mathematics curriculum but is at the forefront of transferring policy changes to classroom practice. As one head teacher commented, *'We can be sure as sure that the curriculum will not stand still; it will move on and Ocean Maths will need to mirror that...what you don't want is for it to become a white elephant and become outdated'*. For example, as greater emphasis is placed on the use of Information Communications Technology (ICT) in mathematics teaching, the OMP may need to adapt its materials and teaching techniques to ensure it remains relevant. Engaging parents in these changes will be particularly important.

SECTION 9: Conclusion

This review, we believe, provides compelling evidence of how an initiative grounded on a vision of parents as intellectual resources, coupled with an unstinting commitment to meeting the needs of its stakeholders (parents, teachers and pupils) can lead to visible improvements, not only in children's mathematics ability, but also in a myriad of other areas. The way in which the OMP has enabled teachers to transfer their methods of teaching mathematics to parents has been crucial in empowering parents to become key agents in their child's learning process. In schools across the London Borough of Tower Hamlets, the OMP has become embedded in the culture and life of the school. Traditional 'school-centric' interpretations of parental involvement are gradually being replaced by a more 'parent-centric' interpretation that values parents' funds of knowledge.

From a project of humble beginnings, in the space of seven years it has been transformed into a project that is championing parental involvement in children's mathematics education, obtaining national acclaim on two occasions. This review marks the end of an important watershed for the OMP. As the OMP begins the next phase of its journey, and spreads beyond the confines of the London Borough of Tower Hamlets, crucial to its success will be its ability to replicate and safeguard the best practice it has nurtured over the years. In effect Ocean Mathematics has developed a strategy which could, if rolled out across UK schools, drastically alter levels of achievement in mathematics across all key stages.

Both the literature review and the review of the OMP have clearly shown that, while some parents lack the tools with which to get involved in their child's education, the majority of parents would like to get more involved and increasingly believe they can play a fundamental role in their child's learning process. Providing parents with the necessary tools, and closing the learning circle of children-parents-teachers, should be each and every school's priority in the coming years.

SECTION 10: Appendices

Appendix I: OMP participating schools

Name of school	Year OMP introduced	Year foundation stage OMP introduced
Primary		
Alice Model		2007
Bangabandhu	2005* for one year only	
Ben Jonson	2001	2007
Blue Gate Fields Infant School	2007	2007
Blue Gate Fields Junior School Primary School	2008	
Bonner	2007	
Canon Barnett	2006	
Cayley	2001	2007
English Martyrs	2008	
Globe	2008	2007
Guardian Angels	2007	
Halley	2001	2007
Harbinger	2008	
Harry Gosling	2005* for one year only	
Holy Family	2008	
John Scurr	2007	
Marnier	2007	
Old Palace	2006	
Phoenix, Primary and Secondary Special School (Autism)	2007	
Redlands	2003	2007
Stebon	2006	
St Paul's	2008	
Secondary		
Central Foundation	2001	
George Green's	2005	
Ian Mikardo, Secondary Special School (SEBD)	2007	
Mulberry	2006	
Phoenix, Primary and Secondary Special School (Autism)	2007	
Stepney Green	2001	
Sir John Cass	2003	
St Paul's Way Community Secondary	2007	
Swanlea	2005* for one year only	

Appendix II: Observations of OMP workshops

Cayley Primary School workshop: year 1

Date: 05.03.08, 09:00 – 09:50

Workshop: Counting

Location: main school hall

Participants: pupils: 58; parents: 40 (29 mums, 11 dads); staff: 4 (deputy head, class teacher and two teaching assistants)

Nationality of pupils/parents: Bangladeshi, one Moroccan and one Algerian.

Observations

Teaching practice

The deputy head and a class teacher jointly delivered the workshop. Two teaching assistants circulated the room helping children and parents.

- ✓ Both teachers spoke very clearly. The deputy head was very welcoming to both the children and the parents saying, “*welcome to your workshop*”.
- ✓ The workshop was very well organised; all the materials were on the tables prior to the workshop. At one point coloured pencils were missing but this was quickly rectified.
- ✓ Feels very personal, i.e. teachers appear to know the majority of the children’s names. At the end of the workshop the deputy head individually thanked the parents for attending as they left.
- ✓ Having the deputy head involved in the workshop gives the workshop a high profile.
- ✓ Additional (optional) homework was given to parents as a way of further engaging the parents in their mathematics learning
- ✗ Neither the children or parents were encouraged to demonstrate the games in front of the class. This would have engaged the children and parents more in the workshop and facilitated an understanding of how the games should be played. Neither did the teachers play the games between themselves to replicate the dynamics of game playing. Instead they explained the game and then asked children (not at any point specifically adults) to put their hands up for the answers.
- ✗ Erratic **interpretation**. OMP was scheduled to send an interpreter, but no one arrived. They improvised by using a bi-lingual class teacher, who had to leave before the final exercise. The game explanations were translated, however not all of the questions were translated (for example, “*can we count in 2s?*”). The interpreter also spoke quite softly and given the number of people in the room and the large size of the hall, not everyone may have understood her. She left before the final exercise which meant there was no translation for the last exercise. In addition, on two occasions they emphasised the importance of returning the homework, however, on the second occasion there was no translation.
- ✗ There was no use of or talk of certificates for handing in homework. Perhaps this could work well as an incentive to improve the homework hand-in rate.

Parental involvement

- ✓ The parents appeared to be engaging well with their children.
- ✗ While the children and their parents were encouraged to play the game together, the parents themselves were not encouraged to engage in their own right, for example by putting their hands up to answer a question, or to come up in front of the class. While some of the parents were participating in some of the number counting games where the teacher asked everyone to count number patterns out loud as a class, many of them were not and no encouragement was given to them to do so.
- ✗ No ideas were given to the parents as to how to apply what they learnt today (counting) to how they related to their child in everyday life.

Other observations

A very impressive turnout!

The free gift for parents at the end was popular.

Halley Primary School workshop: year 3

Date: 27.02.08, 09:00 – 09:50

Workshop: Shape and Space

Location: main school hall

Participants: pupils: 28 (including one special needs pupil); parents: 21 (15 mums, 4 dads and 2 sisters); staff: 4 (mathematics coordinator, class teacher and two teaching assistants (one special needs).)

Nationality of pupils/parents: Bangladeshi

Observations

Teaching practice (also see under parental involvement)

Mathematics coordinator and class teacher jointly delivered the workshop. One teaching assistant was with the special needs child and the other with children whose parents could not attend.

An interpreter was there to translate explanations and to go around the room helping individual parents.

- ✓ Immediately relating the topic of Shape and Space to the local environment was a good way of making it relevant to every day life (for example, who can find a 3-D shape in this hall?).
- ✓ Having two people giving the workshops and playing the games (especially the game in the homework which parents and children will do at home together) with each other replicates the dynamics of parents and children working together and shows them how much fun it can be.
- ✓ At the beginning teachers asked children to help their parents – empowering for children.
- ✓ Giving ideas to parents of how to play games about Shape and Space with their child in every day life e.g. When walking around the street, “I spy something cube” etc.
- ✓ Additional (optional) homework given to parents as a way of further engaging the parents and their mathematics learning.
- ✗ Weak **translation**. The interpreter only translated the explanation at the very beginning and the explanations for playing bingo. No translation during story. When describing the topic of the workshop the English term was used for Shape and Space.
- ✗ No actual explanation of what Shape and Space is. It appeared that the children had already studied it in class, but an additional explanation could have been useful for the parents and as a revision for the children.

Parental involvement

- ✓ The vast majority of parents appeared to be engaging well with their children.
- ✗ There was one parent who did not engage with her child (except briefly during the homework game). The child was playing with another child. This did not appear to be picked up by the teachers.
- ✗ The parents were not actively engaging in terms of putting their hands up to answer questions etc. They were there to support their children. They were not being encouraged to participate to the same extent as their children.

Other observations

The free gift for parents at the end was very popular.

Guardian Angels Primary School workshop: year 4

Date: 12.03.08, 09:00 – 09:50

Workshop: Fractions

Location: main school hall

Participants: pupils: 26; parents: 16 (12 mums, 4 dads); staff: 3 (OMP consultant, mathematics coordinator and one other class teacher)

Nationality of pupils/parents: mixed

Because it was the first OMP workshop, time at the beginning was dedicated to explaining what the purpose of the OM workshops and homework is (including showing and explaining about the homework packs). He emphasised how little time the workshops take up (only three hours per year). An explanation was given on why the homework include games, i.e. the effectiveness of games in mathematics learning and that through paired games, children have to talk and it's when they talk and explain things that they learn best.

Observations

General

- ✓ Very nice arrival to the workshop with the mathematics coordinator welcoming parents as they arrived. There was tea, coffee and biscuits for parents as they waited for the workshop to start. This is a good incentive for parents to arrive early and a nice opportunity for parents to chat. Both the mathematics coordinator and the OMP Consultant gave a very warm welcome to the parents and children.
- ✓ Having an outside Consultant deliver the workshop gave it a high profile. It could have been even more powerful to have the head teacher introduce the Consultant and emphasise the importance of the project.
- ✓ Lots of energy in the classroom; a huge buzz.

Teaching practice

The OMP Consultant delivered the workshop and the mathematics coordinator presented one of the games. One class teacher helped children whose parents were not attending the workshop. There was no interpretation as this was not necessary.

- ✓ When the children/parents were asked a question, rather than just asking a child to say the answer in front of the class, children were asked to explain to their partner first. A child was *then* asked to explain to the whole class.
- ✓ Learning through the games was extremely popular. It was evident that the children thoroughly enjoyed the games. Dividing the children/parents into two teams worked very well as did asking eight volunteers (children) to come up to the front of the class.

Parental involvement

- ✓ The parents were actively engaged in the learning process. On two occasions they were called to the front of the class to demonstrate with the teacher how a game is played. Parents actively participated in the team games (shouting answers out etc).
- ✓ All parents appeared to be engaging well with their children. On numerous occasions they were encouraged to talk to each other.

Redlands Primary School workshop: year 6

Date: 11.03.08, 9:00 – 9:50am

Workshop: Area, Perimeter and Coordinates

Location: school hall

Participants: pupils: 57; parents: 15 (13 mums, one dad and one brother); staff: 6 (mathematics coordinator, two class teachers and three teaching assistants)

Nationality of pupils/parents: vast majority Bangladeshi

Observations

Teaching practice

Mathematics coordinator started the workshop, welcoming the parents, big brothers and emphasising the importance of their presence, their involvement in their child's education and that it's about playing games as a way of learning; about discovering mathematics together and your children explaining to you what they have been learning.

An interpreter was there to translate explanations and to go around the room helping individual parents.

- ✓ Empowering for children - by saying that it is about discovering mathematics together and that the children can explain to their parents what they have been learning in school.
- ✓ Immediately relating the topic of Area, Perimeter and Coordinates to the local environment (the hall in which the workshop was taking place) was a good way of making it relevant to every day life and easy to understand.
- ✓ There were plenty of explanations of how to extend the games to make the games more challenging for certain children. This is a good way of ensuring that all capabilities in the class are catered for. Time-permitting it would have been helpful to give more information on some of the extensions or a brief explanation, for example for the coordinates game the teacher suggested that four quadrants could be used (instead of two) thus using negative numbers as well. Without illustrating this briefly on the blackboard, parents are unlikely to understand this.
- ✓ Good, clear interpretation.
- ✓ Pupils were asked to come up to the front of the class and demonstrate the games.
- ✗ While there was a very good response of children putting their hands up to answer questions, the parents were never encouraged to speak up and answer questions in front of the class or go up to the front of the class to play the games.
- ✗ With one game there was confusion and lack of clarity among the teachers about the rules of the game. This would have been solved with more thorough lesson planning.

Parental involvement

The vast majority of parents appeared to be engaging well with their children. There was one parent who did not engage with her child for one of the games but this did not appear to be picked up by the teachers.

The parents were not actively engaging in terms of putting their hands up to answer questions etc. They were there to support their children. They were not being encouraged to participate to the same extent as their children.

Feedback requested from parents/children

No

Other observations

The free gift for parents at the end was very popular.

George Green Secondary School workshop: year 8

Date: 26.03.08, 09:00 – 10:40

Location: mathematics classroom

Workshop: topic not introduced

Participants: pupils: 29; parents: 7 (3 mums, 2 dads and 2 aunts); staff: 4 (mathematics coordinator, mathematics class teacher and two teaching assistants)

Nationality of pupils/parents: mixed

There was no translation as this was not necessary.

Observations

Teaching practice

The head of mathematics and the class mathematics teacher jointly delivered the OM workshop. In the introduction to the workshop an explanation was given as to the importance of parental involvement in their child's education and homework.

- ✓ The two teachers and teaching assistants went around the class during the exercises to ensure that both parents and children had understood what they are meant to be doing.
- ✓ Both parents and pupils appeared to work well together on the activities and the activities were explained well.
- ✗ While the importance of talking to each other and explaining what they were doing was mentioned, pupils were not explicitly asked to explain how they got an answer or how best to approach a problem to their partner. They were asked to play the games with their partners but only one pupil was called up to the front of class to explain how they obtained their answer.
- ✗ No ideas were given to parents of activities (other than the OM homework) that they could do at home with their children to help them with their math's understanding.

Parental involvement

- ✓ Parents were thanked both at the beginning and end of the workshop for making the effort to attend. The importance of parental involvement with their child's learning was emphasised. VIP (Very Important Parent) certificates for parents were distributed together with a gift for attending (a small white board).
- ✗ One of the pupil's dads was a teacher in the school. He did not attend the workshop. If teachers are emphasising the importance of parental involvement and encouraging them to take time off work to attend the workshops, it would be important that where parents are working in the school itself, that they also attend. Otherwise mixed messages are being sent to the parents.
- ✗ Except for one occasion where both a mum and a daughter were asked to come up to explain how they obtained an answer (to which the girl refused to come up with her mum and so did it alone) only pupils were called upon to give answers. Parents were not explicitly encouraged to give answers to the class.

Feedback from parents/children

- ✓ Parents were asked for feedback following the workshop (as well as asked to write something on a post-it note). Both a mum and a dad were asked to give their views of the workshop to the whole class as well as a pupil.

Other observations

While parents were told the workshop would start at 9am, it did not start until 9:25am. While I was assured that parents were used to waiting in reception. Some of the parents were taking time off work and respect should be shown for this and no time wasted. If carrying out the register and settling the pupils down means that it cannot start until 9:25 then parents should be asked to come at 9:20. Alternatively if a room could be provided where parents can help themselves to tea or coffee while they wait and talk to one another, this would benefit parent-parent relations.

During the refreshments it could have worked better if parents were encouraged to get up and mingle with other parents or even talk to the teachers. Instead everyone just stayed in their seats.

Stepney Green Secondary School workshop: year 7

Date: 29.02.08; 09:00 – 10:40

Workshop: selection of topics

Location: mathematics classroom

Facilities: Big plasma screen for mathematics exercises

Participants: pupils: 22; parents: 12 (4 mums, 8 dads); staff: 5 (2 mathematics teachers, 3 OMP staff; outreach worker, interpreter and crèche worker)

Nationality of pupils/parents: Bangladeshi majority

Teaching practice (also see under parental involvement)

Three different teachers took turns to give the workshop.

- ✓ Parents were given a warm welcome (after a slightly messy start).
- ✓ Children encouraged to explain and to discuss mathematics problems with their parents – empowering for children and encourages parent-child engagement in learning.
- ✓ Good translation of explanations, however, not everything in-between was translated.
- ✓ Having the head of mathematics giving one of the sessions showed the parents and children that the workshop is important for the school and helps give the workshops a high profile.
- ✓ Participation by both parents and children was applauded.
- ✗ No real introduction into what they are going to study in the workshop, how it fits into their general mathematics learning (i.e. that as only one workshop a year, hence why workshop will look at a selection of topics) and how it fits in with their homework. One teacher said, “*Today we will try and make you like numbers*”.
- ✗ The very start of the workshop was a bit messy and hand-over between teachers was not always smooth. Each teacher should take time to thank parents for their attendance before handing over to the next teacher.

Parental involvement

- ✓ *Engaging both parents and children.* The teachers generally encouraged parents to participate, “*I want the parents to contribute*”, “*I especially want parents to contribute*.” Both children and parents were called up to the front to give or explain their answers. A parent and child were brought up to do the game in front of everybody.
- ✓ Encouragement given to parents that they can help their children; that it is important that they work together and help each other.
- ✓ While no Ocean Mathematics homework was introduced during the workshop they were told what the next homework would be on (fractions, percentages and decimals) and asked to help them. Not just supervise but work alongside their children. Share it.
- ✓ Parents were encouraged not only to give feedback after the workshop but also to ask any questions they may have. They were also encouraged to visit the head of mathematics should they have any questions.
- ✓ At the end of the workshop verbal feedback was requested from two parents (one mum one dad) and two children. Parents and children were also asked to write on post-it notes and told they can write in any language. Among their comments were:

“Most importantly I’m happy to see what they are learning and to help my son at home. I would like more workshops” (father)

“I think they are good. It gives you the confidence to work with other people as well as tackling quite complicated sums” (pupil)

In answer to one fathers question if there was any extra homework his son could have, he was told to refer to the website www.sumlearning.com

Appendix III – Attainment results of participating schools, KS2 and KS3

No.	School	No. of Forms	Year groups	Start date with Ocean Maths	KS2 Results (%)															
					2001		2002		2003		2004		2005		2006		2007		% increase from the 1st year of participation	
					Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5	Level 4 or above	Level 5
1	Cayley	2	All	2001	47		66		60	15	74	13	83	29	86	38	92	49	45	34
2	Ben Jonson	2	All	2001	81		67		71	15	74	20	54	13	55	18	78	24	-3	9
3	Halley	1	All	2001	78		87		86	46	83	52	83	43	71	25	77	30	-1	-16
4	Redlands	2	All	2003			67		63	14	71	29	58	18	81	27	85	29	18	15
5	Canon Barnett	1	All	2006									71	13	69	35	100	21	29	8

No.	School	Year groups	Start date with Ocean Maths	KS3 Results (%)							
				2001	2002	2003	2004	2005	2006	2007	% Increase from the 1st year of participation
				Level 5 or above							
1	Stepney Green	7/8/9	2001		50	67	66	72	77	69	19
2	Central Foundation	7/8/9	2001		54	59	64	65	70	64	10
3	Sir John Cass	7/8/9	2004			53	62	63	67	75	22
4	George Green's	7/8/9	2005				66	60	62	69	3
5	Mulberry	7/8/9	2006					65	71	71	6

Statistics provided by OMP

References

- Abd-El-Fattah, S. M. (2006) 'Effects of Family Background and Parental Involvement on Egyptian Adolescents? Academic Achievement and School Disengagement: A Structural Equation Modelling Analysis', *Social Psychology of Education*, 9(2), 139-157.
- Allexsaht-Snider, M. (2006) 'Editorial: Urban Parents' Perspectives on Children's Mathematics Learning and Issues of Equity in Mathematics Education', *Mathematical Thinking and Learning*, 8(3), 187-195.
- Anderson, A., Anderson, J. and Shapiro, J. (2005) 'Supporting Multiple Literacies: Parents' and Children's Mathematical Talk within Storybook Reading', *Mathematics Education Research Journal* 16(3), 5-26.
- Andrews, J., Wan Ching, Y., Greenhough, P., Hughes, M. and Winter, J. (2005) 'Teachers' Funds of Knowledge and the Teaching and Learning of Mathematics in Multi-Ethnic Primary Schools: Two Teachers' Views of Linking Home and School', *ZDM International Journal on Mathematics Education*, 37(2), 72-80.
- Anhalt, C.O., Allexsaht-Snider, M. and Civil, M. (2002) 'Voices: Community, Parents, Teachers, and Students: Middle School Mathematics Classrooms: A Place for Latina Parents' Involvement', *Journal of Latinos and Education*, 1(4), 255-262.
- Aunola, K., Nurmi, J.E., Lerkkanen, M.K. and Rasku-Puttonen, H. (2003) 'The Roles of Achievement-Related Behaviours and Parental Beliefs in Children's Mathematical Performance', *Educational Psychology - Basingstoke*, 23(4), 403-421.
- Bailey, Battle, L. (2006) 'Interactive Homework: A Tool for Fostering Parent-Child Interactions and Improving Learning Outcomes for At-risk Young Children', *Early Childhood Education Journal*, 34(2), 155-167.
- Bakker, J. and Denessen, E. (2007) 'The concept of parental involvement. Some theoretical and empirical considerations', *International Journal about Parents in Education*, 1(0), 188-199.
- Bastiani, J. (2002) *New Deal for Communities. The Ocean Maths Project: an initial review*.
- Bastiani, J. (2004) *Ocean Mathematics Project. A follow up review*.
- Bernier, E., Allexsaht-Snider, M. and Civil, M. (2003) 'Teachers, parents and Mathematics: Exploring contexts for collaboration and partnership'. Paper presented at the annual meeting of AERA, Chicago, IL.
- Blevins-Knabe, B., Austin, A.B., Musun, L., Eddy, A. and Jones, R. (2000) 'Family Home Care Providers' and Parents' Beliefs and Practices Concerning Mathematics with Young Children', *Early Child Development and Care*, 165(1), 41-58.
- Bouakaz, L. and Persson, S. (2007) 'What hinders and what motivates parents' engagement in school?' *International Journal about Parents in Education*, 1(0), 97-107.
- Cai, J. (2003) 'Investigating parental roles in students' learning of mathematics from a cross-cultural perspective', *Mathematics Education Research Journal* 15(2), 87-106.
- Cai, J., Moyer, J. and Wang, N. (1999) 'Parental Roles in Students' Learning of Mathematics: An Exploratory Study', *Research in Middle Level Education Quarterly*, 22(3), 1-18.
- Cao, Z., Bishop, A. and Forgasz, H. (2006) 'Perceived Parental Influence on Mathematics Learning: A Comparison among Students in China and Australia', *Educational Studies in Mathematics*, 64, 85-106.
- Carlisle, E., Stanley, L. and Kemple, Mary, K. (2005) 'Opening Doors: Understanding School and Family Influences on Family Involvement', *Early Childhood Education Journal*, 33(3), 155-162.

- Carpentier, V. and Lall, M. (2005) 'Review of Successful Parental Involvement Practice for 'hard to reach' Parents', Institute of Education and The London Challenge.
- Civil, M., Bratton, J. and Quintos, B. (2005) 'Parents and Mathematics Education in a Latino Community: Redefining Parental Participation', *Multicultural Education*, 13(2), 60-64.
- Civil, M., Planas, N. and Quintos, B. (2005) 'Immigrant Parents' Perspectives on their Children's Mathematics Education', *ZDM International Journal on Mathematics Education*, 37(2), 81-89.
- Civil, M. and Bernier, E. (2006) 'Exploring Images of Parental Participation in Mathematics Education: Challenges and Possibilities', *Mathematical Thinking and Learning*, 8(3), 309-330.
- De Abreu, G. and Cline, T. (2005) 'Parents' representations of their children's mathematics learning in multiethnic primary schools', *British Educational Research Journal*, 31(6), 697-722.
- Desforges C. and Abouchaar.A. (2003), The Impact of Parental Involvement, Parental Support and Family Education on Pupil Achievements and Adjustment: A literature Review. Research Report RR433, London: DfES.
- Department for Education and Skills, (2006), The Manchester Transition Project: Implications for the Development of Parental Involvement in Primary Schools. Research Report RW95, London: DfES.
- Department for Education and Skills, (2004), Aiming High: Understanding the Educational Needs of Minority Ethnic Pupils in Mainly White Schools. A Guide to Good Practice. DfES/0416/2004, London: DfES.
- Driessen, G., Smit, F. and Slegers, P. (2005) 'Parental Involvement and Educational Achievement', *British Educational Research Journal*, 31(4), 509-532.
- Eloff, I., Maree, J. G. and Miller, L. H. (2006) 'The role of parents' learning facilitation mode in supporting informal learning in mathematics', *Early Child Development and Care*, 176(3), 313-328.
- Epstein, J. L., Salinas, K. C. and Van Voorhis, F. L. (2001) *Teachers Involve Parents in Schoolwork (TIPS) Manuals*. Baltimore, MD: Center on School, Family, and Community Partnerships, Johns Hopkins University.
- Gellert, U. (2005) 'Parents: support or obstacle for curriculum innovation?', *Journal of Curriculum Studies*, 37(3), 313-328.
- Georgiou, S.N. and Tourva, A. (2007) 'Parental attributions and parental involvement', *Social Psychology of Education*, 10, 473-482.
- Gonzalez-DeHass, A., Willems, P. and Doan Holbein, M. (2005) 'Examining the Relationship Between Parental Involvement and Student Motivation', *Educational Psychology Review*, 17(2), 99-123.
- Hawighorst, B. (2005), 'Parents' Views on Mathematics and the Learning of Mathematics -An Intercultural Comparative Study', *ZDM International Journal on Mathematics Education*, 37(2).
- Hyde, J. S., Else-Quest, N. M., Alibali, M.W., Knuth, E. and Romberg, T. (2006) 'Mathematics in the home: Homework practices and mother/child interactions doing mathematics', *Journal of Mathematical Behavior*, 25(2), 136-152.
- Jackson, K. and Remillard, J. (2005) 'Rethinking Parent Involvement: African American Mothers Construct their Roles in the Mathematics Education of their Children' *School Community Journal*, 15(1), 51-73.
- Joep B. and Denessen E. (2007) 'The concept of parent involvement. Some theoretical and empirical considerations', *International Journal about Parents in Education*, 1(0), 188-199.

- Knopf, H. T. and Swick, K. J. (2007) 'How Parents Feel About Their Child's Teacher/School: Implications for Early Childhood Professionals', *Early Childhood Education Journal*, 34(4), 291-296.
- Lall, M., Campbell, C. and Gillborn, D. (2004) *Parent Involvement in Education Research* New Deal for Communities: The National Education, Educational Policy Research Unit Report 31.
- Lall, M. and Gillborn, D. (2003) Raising Educational Achievement. Research Report 10. Institute of Education, University of London.
- Lee, S.M., Kushner, J. and Cho, S.H. (2007) 'Effects of Parent's Gender, Child's Gender, and Parental Involvement on the Academic Achievement of Adolescents in Single Parent Families', *Sex Roles*, 56, 149-157.
- Martin, D. B. (2006) 'Mathematics Learning and Participation as Racialized Forms of Experience: African American Parents Speak on the Struggle for Mathematics Literacy', *Mathematical Thinking and Learning*, 8(3), 197-229.
- Mau, W. C. (1997) 'Parental influences on the high school students' academic achievement: A comparison of Asian immigrants, Asian Americans, and White Americans', *Psychology in the Schools*, 34(3), 267-277.
- Merttens, R. and Vass, J. (1993) *Partnerships in Maths. Parents and Schools Project*. London. The Falmer Press.
- Merttens, R. and Vass, J. (1990) *Sharing Maths Cultures. IMPACT. Inventing Maths for Parents and Children and Teachers*. London. The Falmer Press.
- Neuenschwander, M.P., Vida, M., Garrett, J. L. and Eccles, J. S. (2007) 'Parents' expectations and students' achievement in two western nations', *International Journal of Behavioral Development*, 31(6), 594-602.
- Pan, Y., Gauvain, M., Liu, Z. and Cheng, L. (2006) 'American and Chinese parental involvement in young children's mathematics learning', *Cognitive Development*, 21(1), 17-35.
- Patterson, V. (2006) *An exploration of the barriers to parental involvement*, dissertation, London, Institute of Education, University of London.
- Peressini, D.D. (1998) 'The portrayal of parents in the school mathematics reform literature: Locating the context for parental involvement', *Journal for Research in Mathematics Education*, 29, 555-582.
- Peters, M., Seeds, K., Goldstein, A. and Coleman, N. (2008) *Parental Involvement in Children's Education 2007*. Research Report DCSF-RR034. BMRD Social Research.
- Phillipson, S. and Phillipson, S. N. (2007) 'Academic Expectations, Belief of Ability, and Involvement by Parents as Predictors of Child Achievement: A cross-cultural comparison', *Educational Psychology - Basingstoke*, 27(3), 329-348.
- Pound, L. (2006) *Ocean Mathematics Project. Foundation Stage at Halley School. Pilot Study 2005-2006. Evaluation Report*.
- Pritchard, R. (2004), 'Investigating Parental Attitudes and Beliefs in Mathematics Education', *Mathematics Education Research Journal*, Wellington College of Education.
- Remillard, J.T.; Jackson, K. (2006) 'Old Math, New Math: Parents' Experiences with Standards-Based Reform' *Mathematical Thinking and Learning*, 8(3), 231-259.
- Seginer, R. (2006) 'Parents' Educational Involvement: A Developmental Ecology Perspective', *Parenting: Science and Practice*, 6(1), 5-26.

- Simpkins, S., Weiss, H., McCartney, K., Kreider, E. and Dearing, E. (2006) 'Mother – Child Relationship as a Moderator of the Relation Between Family Educational Involvement and Child Achievement', *Parenting*, 6(1), 49-57.
- Smith, F. M. and Hausafus, C. O. (1998) 'Relationship of family support and ethnic minority students' achievement in science and mathematics', *Science Education*, 82(1), 111-125.
- Sohn, S. and Wang, C. (2006) 'Immigrant Parents' Involvement in American Schools: Perspectives from Korean Mothers', *Early Childhood Education Journal*, 34(2), 125-132.
- Souto-Manning, M. (2006) 'Families Learn Together: Reconceptualising Linguistic Diversity as a Resource', *Early Childhood Education Journal*, 33(6), 443-446.
- Souto-Manning, M. and Swick, K. J. (2006) 'Teachers? Beliefs about Parent and Family Involvement: Rethinking our Family Involvement Paradigm', *Early Childhood Education Journal*, 34(2), 187-193.
- Starkey, P. and Klein, A. (2000) 'Fostering Parental Support for Children's Mathematical Development: An Intervention with Head Start Families', *Early Education and Development*, 11(5), 659 – 680.
- Sure Start Programme (2007) Parents as partners in Early Learning (PPEL) project: Parental involvement: a snapshot of policy and practice: PPEL project phase 1 report.
- Tsui, M. (2005) 'Family Income, Home Environment, Parenting, and Mathematics Achievement of Children in China and the United States', *Education and Urban Society*, 37(3), 336-355.
- Warren, E. and Young, J. (2002) 'Parent and School Partnerships in Supporting Literacy and Numeracy', *Asia Pacific Journal of Teacher Education*, 30(3), 217-.
- Wenfan Y. and Qiuyun L. (2005) 'Parental Involvement and Mathematics Achievement: Contrast Across Racial and Ethnic Groups', *The Journal of Educational Research*, 99(2), 116-127.
- Williams, P. (2008) *Review of Mathematics Teaching in Early Years Settings and Primary Schools*. Interim report. London, DfES.
- Zhongun C., Bishop, A. and Forgasz, H. (2006) 'Perceived Parental Influence on Mathematics Learning: A comparison among Students in China and Australia', *Educational Studies in Mathematics*, 64, 85-106.